

Limited Energy Study  
Energy Engineering Analysis Program (EEAP)  
Fort Knox, Kentucky

*Final Report*

*Volume 1  
Sections 1-3*

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NOVEMBER 5, 1993

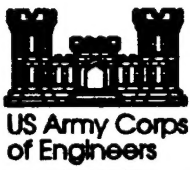
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## 1 EXECUTIVE SUMMARY

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### 1.1 SYNOPSIS

Systems Corp surveyed and completed energy analyses for 37 buildings, and eight ballfields. The energy conservation opportunities (ECOs) evaluated were ceiling reflectance, high efficiency indoor lighting, indoor lighting controls, and ballfield lighting and control systems. Cost estimates were prepared using M-CACES. Life cycle cost analyses were performed using the Life Cycle Cost in Design (LCCID) computer program. Project development brochures (PDBs) and DD1391 forms were prepared for a Energy Conservation Investment Program (ECIP) project. The project that was developed represents \$93,956 in annual savings with favorable simple paybacks and saving to investment ratios (SIRs).

### 1.2 INTRODUCTION

Systems Engineering and Management Corporation (SYSTEMS/CORP) was contracted by the Louisville District of the United States Army Corps of Engineers in June 1993 to perform a limited energy study for 37 buildings at Fort Knox, Kentucky. In addition, the project includes a ballfield lighting survey of 8 locations.

#### 1.2.1 Scope of Work

1. Evaluated selected energy conservation opportunities (ECOs) to determine their energy savings potential and economic feasibility.
2. Conduct a limited site survey of selected buildings or areas to insure that any methods of energy conservation which are practical and have not been evaluated in any previous energy study have been considered and the results documented.
3. Determine efficiency of existing systems. Determine the replacement option with the highest SIR.
4. Provide complete programming or implementation documentation for all recommended ECOs.

## 1 EXECUTIVE SUMMARY

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5. Prepare a comprehensive report to document the work performed, the results, and the recommendations.

### 1.2.2 Organization of the Final Report

The submitted material for this report consists of the following:

Volume I: Executive Summary, Methods and Approach, and Programming Document-ECIP Project I

Volume II: Programming Document-ECIP Project (Continued), Scope of Work, Interim Review Meeting Minutes, Interim Review Comments and Responses, and Interim Review Presentation

## 1.3 PRESENT AND HISTORICAL ENERGY CONSUMPTION

The baseline energy consumption and energy conservation opportunity energy consumption were determined using spreadsheets and manual calculating to model system energy consumption. These have been included in *Section 2* of this report.

### 1.3.1 Natural Gas Costs

The natural gas consumption and cost for FY92 (October 1991-September 1992) at Fort Knox are shown in *Table 1.3.1, Fort Knox Natural Gas*. *Figure 1.3.1* is a bar graph of the monthly consumption and costs. The natural gas cost used for evaluating the ECOs is as follows:

$$\text{COST/MBTU} = \$3.74/\text{MBTU}$$

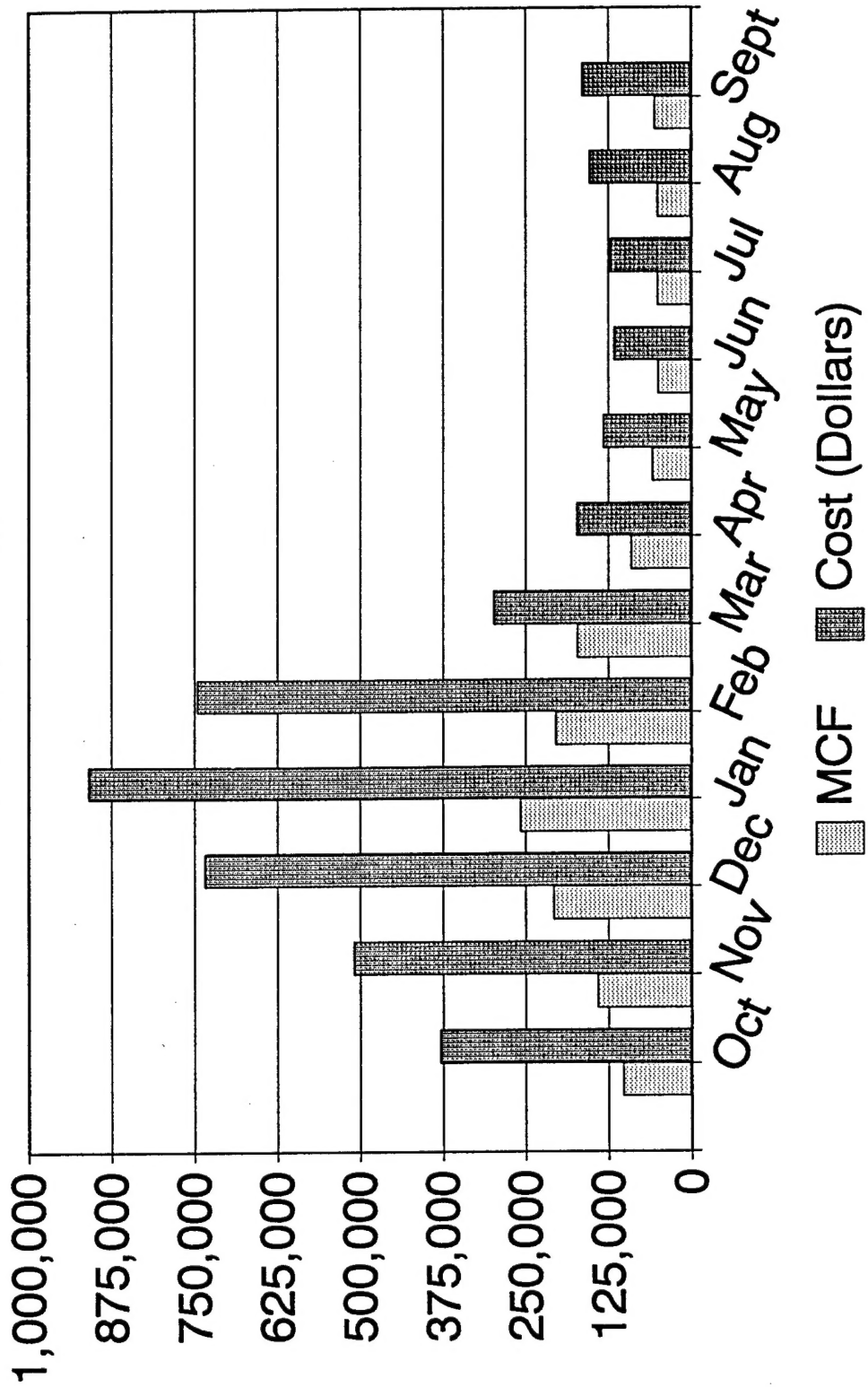
**TABLE 1.3.1**  
**FORT KNOX NATURAL GAS**  
Oct 91 - Sept 92

| MONTH        | DEMAND         | CONSUMPTION<br>MCF | COST               | COST/MCF     |
|--------------|----------------|--------------------|--------------------|--------------|
| Oct 91       | 14,616         | 103,670            | \$379,995          | \$3.665      |
| Nov          | 14,616         | 141,650            | 510,079            | 3.601        |
| Dec          | 11,000         | 208,531            | 734,825            | 3.524        |
| Jan          | 11,034         | 259,223            | 909,415            | 3.508        |
| Feb          | 12,559         | 205,339            | 746,795            | 3.637        |
| Mar          | 12,559         | 171,895            | 297,539            | 1.731        |
| April        | 12,559         | 91,273             | 172,523            | 1.890        |
| May          | 12,559         | 59,090             | 133,344            | 2.257        |
| Jun          | 12,559         | 50,734             | 116,873            | 2.304        |
| Jul          | 12,559         | 51,981             | 122,570            | 2.358        |
| Aug          | 12,559         | 51,954             | 154,449            | 2.973        |
| Sept         | 12,559         | 56,458             | 166,220            | 2.944        |
| <b>TOTAL</b> | <b>151,738</b> | <b>1,451,798</b>   | <b>\$4,444,627</b> | <b>3.06</b>  |
| <i>Min</i>   | <i>11,000</i>  | <i>50,734</i>      | <i>116,873</i>     | <i>1.731</i> |
| <i>Max</i>   | <i>14,616</i>  | <i>259,223</i>     | <i>909,415</i>     | <i>3.665</i> |
| <i>Avg</i>   | <i>12,645</i>  | <i>120,983</i>     | <i>370,385</i>     | <i>2.866</i> |

FIGURE 1.3.1

# FORT KNOX

FY92 Natural Gas



## 1 EXECUTIVE SUMMARY

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### 1.3.2 Electric Costs

The electric energy consumption, demand, and costs for FY92 are shown in *Table 1.3.2 Fort Knox Electric*. *Figure 1.3.2* is a bar graph of the monthly consumption and cost. The electric cost used to calculate the electric cost savings for the project is as follows:

|           |                               |
|-----------|-------------------------------|
| COST/KWH  | = \$0.02506/KWH (No Demand)   |
| COST/MBTU | = \$7.343/MBTU (No Demand)    |
| COST/KW   | = \$7.067/KW (Monthly Demand) |

### 1.4 ENERGY CONSERVATION OPPORTUNITIES INVESTIGATED

Systems Corp analyzed four energy conservation opportunities (ECOs) at Fort Knox, Kentucky. The analysis was performed utilizing energy models developed by Systems Corp and data collected during the field survey of the facilities at Fort Knox. Each ECO was evaluated to determine the potential energy savings, dollar savings, implementation costs, simple payback, life cycle cost, and savings to investment ratio (SIR). The four ECOs that were evaluated are as follows:

ECO - 1 Ceiling Reflectance

ECO - 2 High Efficiency Indoor Lighting

ECO - 3 Indoor Lighting Controls

ECO - 4 Ballfield Lighting and Controls

Systems Corp's energy analysis models were used to determine the savings achieved for implementing each ECO in the facilities that were evaluated. The U.S Army Corp of Engineers M-CACES software was used to estimate the implementation cost of each ECO in each facility evaluated. The U.S Army Corp of Engineers Life Cycle Cost in Design, Version 1.0, Level 72, software was used to perform life cycle cost analyses and determine the SIR of each ECO for each facility evaluated.

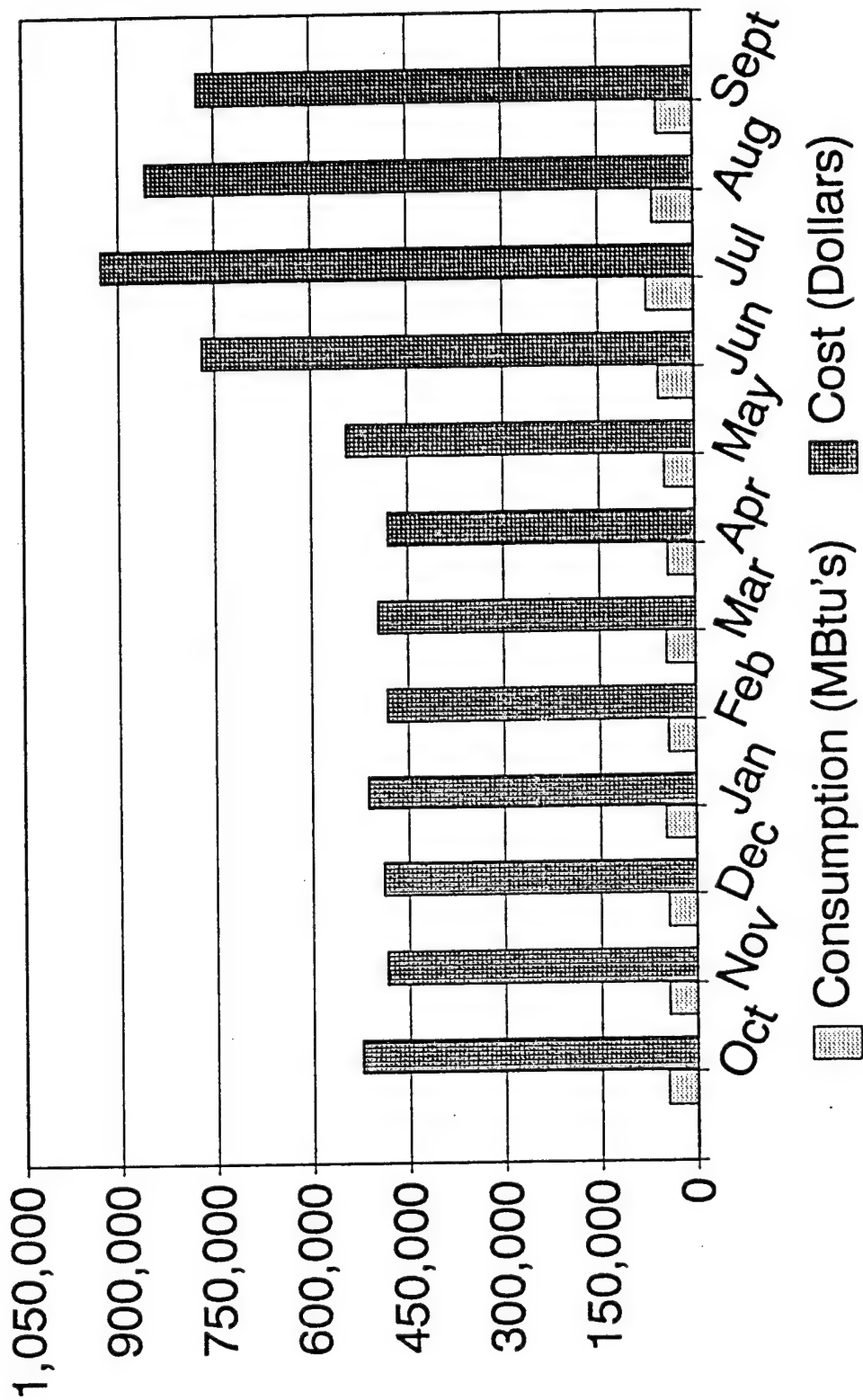
**TABLE 1.3.2**  
**FORT KNOX ELECTRIC**  
**Oct 91 - Sept 92**

| MONTH        | DEMAND<br>KW   | CONSUMPTION<br>KWH | COST<br>DEM & CONS | COST/KWH       |
|--------------|----------------|--------------------|--------------------|----------------|
| Oct 91       | 28,950         | 13,601,000         | \$524,094          | \$ .039        |
| Nov          | 24,650         | 13,109,000         | 484,546            | .037           |
| Dec          | 24,950         | 13,205,000         | 488,850            | .037           |
| Jan          | 25,850         | 13,954,000         | 513,317            | .037           |
| Feb          | 25,250         | 12,886,000         | 482,755            | .037           |
| Mar          | 24,800         | 13,579,000         | 497,273            | .037           |
| April        | 25,100         | 12,891,000         | 481,931            | .037           |
| May          | 30,650         | 14,006,000         | 545,004            | .039           |
| Jun          | 41,700         | 16,504,000         | 769,708            | .047           |
| Jul          | 44,400         | 21,867,000         | 927,163            | .042           |
| Aug          | 44,300         | 19,172,000         | 858,772            | .045           |
| Sept         | 41,250         | 16,933,000         | 776,615            | .046           |
| <b>TOTAL</b> | <b>381,850</b> | <b>181,707,000</b> | <b>\$7,350,028</b> | <b>\$ .040</b> |
| Min          | 24,650         | 12,886,000         | \$481,931          | \$ .037        |
| Max          | 44,400         | 21,867,000         | 927,163            | .047           |
| Avg          | 31,820         | 15,142,250         | 612,502            | .040           |



FIGURE 1.3.2

# FORT KNOX FY92 Electric



## **1 EXECUTIVE SUMMARY**

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### **1.4.1 ECOs Recommended**

Systems Corp recommended that the following ECOs be implemented due to favorable simple pay backs and savings investment ratios (SIRs).

ECO - 2 High Efficiency Indoor Lighting

ECO - 3.1 Indoor Lighting Controls (On/Off Photocells)

ECO - 4 Ballfield Lighting and Controls

### **1.4.2 ECOs Rejected**

ECO-1, Ceiling Reflectance, was rejected due to the fact that the potential energy savings was found to be quite small for each building that was evaluated. The implementation costs for each building evaluated did not represent a large investment, but when compared to the savings resulted in simple paybacks in excess of thirty years. Improving the ceiling reflectance did not yield an acceptable simple payback in any of the buildings evaluated. ECO-3.2, Dimming and On/Off Photocell Control, was rejected. ECO-3.1, on/off photocell control, has a better SIR and SPB than ECO-3.2.

### **1.4.3 ECIP Projects Developed**

Systems Corp developed one ECIP project. The project include the improvement of lighting efficiency in 16 buildings, installation of lighting controls in 23 buildings, and the improvement of lighting efficiency at 3 ballfields and lighting control at 8 ballfields. The following table summarizes the savings and investment for each ECO included in the ECIP project.

**TABLE 1.4.3**

**ECIP PROJECT SUMMARY**

|                           |                                  | 1st Yr Savings  | Investment       | SIR         | SPB(yrs)    |
|---------------------------|----------------------------------|-----------------|------------------|-------------|-------------|
| ECO-2                     | INDOOR LIGHTING<br>EFFICIENCY    | \$50,872        | \$277,658        | 2.08        | 5.46        |
| ECO-3.1                   | INDOOR LIGHTING<br>CONTROLS      | \$38,595        | \$113,162        | 3.88        | 2.93        |
| ECO-4                     | BALLFIELD LIGHTING<br>& CONTROLS | \$4,489         | \$20,122         | 2.60        | 4.48        |
| <b>TOTAL ECIP PROJECT</b> |                                  | <b>\$93,956</b> | <b>\$410,942</b> | <b>2.61</b> | <b>4.37</b> |

## 2 METHODS AND APPROACH

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### 2.1 FIELD SURVEY

The field survey as performed by Systems Corp was designed to provide the necessary data required to complete the project. It was also designed to provide residual benefits to the installation by providing an organized and readily available source of information which can be used in future years. The information was transmitted in the form of field notes made on standardized survey forms. The field survey forms were submitted with the interim report.

The survey forms were designed to allow notations of all data which could be utilized (not necessarily required) to calculate the energy savings gained by implementing a specific energy conservation opportunity. These forms contain data obtained from as-built drawings and confirmed in the field as well as data obtained only in the field.

## 2 METHODS AND APPROACH

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### 2.1.1 Buildings

Thorough preparation for the building survey was required to assure that the data required to perform the technical analysis is obtained. The building surveys were performed in a manner which assured the best results. A simple listing of each step of the process best describes our approach to the surveys.

1. The list of ECOs included in the work scope were reviewed in detail.
2. Each ECO was given an identification number which is used consistently throughout this project.
3. An expanded description of each ECO was formulated to outline the possible methods for implementation of the ECO.
4. Survey forms were developed for each ECO to provide space to enter and data which might possibly be used in performing the engineering and economic analysis of the ECO.
5. A list of the types of as-built drawings required for the buildings was prepared based on the information required on the ECO survey forms.
6. A Systems Corp representative assisted during the survey in gathering the necessary as-built drawings.
7. Due to the age of drawings, it was determined that most required information would need to be gathered during the survey at the buildings.
8. The building surveys were then performed, confirming or revising data obtained from the drawings. Additional data was obtained as required.
9. Systems Corp's survey team met with the post energy coordinator throughout the survey on an as needed basis.

*Table 2.1.1.1* is a list of the buildings surveyed sorted by building type.

**TABLE 2.1.1.1  
BUILDINGS SURVEYED**

| <b>BUILDING<br/>TYPE</b>  | <b>BUILDING<br/>NUMBER</b> | <b>BUILDING<br/>AREA</b> |
|---------------------------|----------------------------|--------------------------|
| ADMINISTRATIVE            | 63                         | 21,054                   |
|                           | TOTAL AREA THIS TYPE       | 21,054                   |
| WAREHOUSE                 | 86                         | 21,716                   |
|                           | 92                         | 13,298                   |
|                           | 58                         | 10,091                   |
|                           | 59                         | 10,091                   |
|                           | 60                         | 10,091                   |
|                           | TOTAL AREA THIS TYPE       | 65,287                   |
| AIRCRAFT HANGAR           | 5220                       | 50,027                   |
|                           | 5222                       | 35,392                   |
|                           | 5256                       | 20,179                   |
|                           | 5253                       | 18,905                   |
|                           | TOTAL AREA THIS TYPE       | 124,503                  |
| MACHINE SHOP              | 73                         | 13,580                   |
|                           | TOTAL AREA THIS TYPE       | 13,580                   |
| GENERAL MAINTENANCE SHOP  | 94                         | 30,894                   |
|                           | TOTAL AREA THIS TYPE       | 30,894                   |
| AIRCRAFT MAINTENANCE SHOP | 5232                       | 13,639                   |
|                           | TOTAL AREA THIS TYPE       | 13,639                   |

**TABLE 2.1.1.1**  
**BUILDINGS SURVEYED**

| BUILDING<br>TYPE         | BUILDING<br>NUMBER   | BUILDING<br>AREA |
|--------------------------|----------------------|------------------|
| VEHICLE MAINTENANCE SHOP | 2770                 | 111,566          |
|                          | 2778                 | 53,494           |
|                          | 2730                 | 26,985           |
|                          | 5901                 | 22,786           |
|                          | 159                  | 20,833           |
|                          | 486                  | 20,180           |
|                          | 158                  | 18,271           |
|                          | 2942                 | 17,220           |
|                          | 2943                 | 17,220           |
|                          | 482                  | 16,923           |
|                          | 483                  | 16,479           |
|                          | 484                  | 16,479           |
|                          | 485                  | 16,479           |
|                          | 487                  | 16,479           |
|                          | TOTAL AREA THIS TYPE | 391,394          |
| TANK MAINTENANCE SHOP    | 2944                 | 21,840           |
|                          | 2970                 | 7,421            |
|                          | 2969                 | 7,421            |
|                          | 2963                 | 7,220            |
|                          | 2971                 | 6,900            |
|                          | 2972                 | 6,900            |
|                          | 2973                 | 6,900            |
|                          | 2974                 | 6,900            |
|                          | 2979                 | 6,900            |
|                          | 2980                 | 6,900            |
|                          | TOTAL AREA THIS TYPE | 85,302           |

## 2 METHODS AND APPROACH

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### 2.1.2 Ballfield Lighting

The exterior lighting survey was performed in much the same way as the building survey. The approach for the ballfield lighting survey was to survey the specified locations on the post. A listing of the steps required to complete this task are as follows:

1. The ECO was reviewed in detail and given an identification number.
2. An expanded description of the ECO was formulated to outline the possible methods of implementation.
3. A survey form was developed.
4. Site maps were reviewed and survey locations were identified.
5. A preliminary site survey was performed to establish fixture distances, mounting height and fixture layouts.
6. Sketches of the locations and preliminary data were prepared for field notes.
7. Lamp wattage information was obtained from the high voltage electrical maintenance staff.
8. A daylight survey of each location was performed to identify fixture and lamp types, wattage and voltage.
9. A nighttime survey was performed to measure light levels at each of the surveyed locations.

*Table 2.1.2.1* is a listing of the areas surveyed for ballfield lighting.



**TABLE 2.1.2.1**  
**BALLFIELDS SURVEYED**

| AREA<br>NUMBER | AREA NAME                  | FIXTURES CURRENTLY IN USE |                 |             |             |
|----------------|----------------------------|---------------------------|-----------------|-------------|-------------|
|                |                            | 1000W<br>INCAN            | 1500W<br>QUARTZ | 1000W<br>MH | 1500W<br>MH |
| 2358           | GARY OWENS REGIMENT        | 36                        |                 |             |             |
| 2388 N         | BLACK HORSE/HELL ON WHEELS |                           | 29              |             |             |
| 2388 S         | BLACK HORSE/HELL ON WHEELS |                           | 28              |             |             |
| 4557           | KEYS PARK                  |                           |                 |             | 26          |
| 5913           | DISNEY AREA                |                           |                 | 39          |             |
| 6532           | 2ND DRAGON/BACHLER         |                           |                 | 28          |             |
| 6609           | TURRETT FIELD              |                           |                 |             | 48          |
| 6647           | EAST-WEST                  |                           |                 |             | 50          |

## 2 METHODS AND APPROACH

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### 2.2 CALCULATIONS

Energy calculations were performed using computerized techniques. Due to the large volume of calculations to be performed, standardized procedures were developed for the computer models. This assured consistent results and uniformity of quality in all of the calculations performed.

#### 2.2.1 Baseline Energy Consumption

The following sections will describe the method for calculating the baseline energy consumption for each of the four ECOs.

##### 2.2.1.1 Baseline Energy Consumption: ECO - 1

The baseline energy consumption for this ECO was calculated using a LOTUS123 spreadsheet. This spreadsheet modeled the energy consumption of the heating system with the existing insulation. The energy consumption was modeled using field measurements and weather bin data. The heating system efficiency was assumed to be 55%. This took into account boiler efficiency, distribution losses and unit heater efficiency.

*Table 2.2.1.1.1* lists the baseline energy consumption for this ECO.

**TABLE 2.2.1.1.1**  
**BASELINE ENERGY**  
**CONSUMPTION ECO-1**

| BUILDING<br>NUMBER | BASELINE ENERGY<br>CONSUMPTION (MBTU) |
|--------------------|---------------------------------------|
| 58                 | 184.480                               |
| 59                 | 184.480                               |
| 60                 | 184.480                               |
| 86                 | 113.080                               |
| 92                 | 48.850                                |
| 158                | 82.320                                |
| 159                | 82.320                                |
| 482                | 75.090                                |
| 483                | 75.090                                |
| 484                | 75.090                                |
| 485                | 75.090                                |
| 486                | 75.090                                |
| 487                | 49.760                                |
| 5253               | 41.160                                |

## 2 METHODS AND APPROACH

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### 2.2.1.2 Baseline Energy Consumption: ECO - 2

The baseline energy consumption for this ECO was calculated using a LOTUS 123 spreadsheet. This spreadsheet modeled the energy consumption of the existing lighting system by utilizing the following:

1. Existing fixture and lamp type (i.e. fluorescent, mercury vapor, etc.)
2. Lamp wattage.
3. Ballast wattage.
4. Hours of use.

The above information was obtained during the field survey. *Table 2.2.1.2.1* lists the baseline energy consumption for this ECO.

### 2.2.1.3 Baseline Energy Consumption: ECO - 3

The baseline energy consumption for this ECO was calculated using a LOTUS123 spreadsheet. The energy consumption was modeled using field measurements and local climatological data for Fort Knox. This spreadsheet modeled the energy consumption of the existing lighting control system by utilizing the following:

1. Existing fixture and lamp type (i.e. fluorescent, mercury vapor, etc.)
2. Lamp wattage.
3. Ballast wattage.
4. Hours of use.

The above information was obtained during the field survey. *Table 2.2.3.1* lists the baseline energy consumption for this ECO.

# **TABLE 2.2.1.2.1** **BASELINE ENERGY** **CONSUMPTION ECO-2**

| <b>BUILDING<br/>NUMBER</b> | <b>BASELINE ENERGY<br/>CONSUMPTION (MBTU)</b> |
|----------------------------|---|
| 58                         | 73.646  |
| 59                         | 109.591                                       |
| 60                         | 103.588                                       |
| 63                         | 322.013                                       |
| 73                         | 86.089  |
| 86                         | 236.466                                       |
| 92                         | 103.892                                       |
| 482                        | 107.677                                       |
| 483                        | 134.598                                       |
| 484                        | 107.677                                       |
| 485                        | 127.868                                       |
| 486                        | 131.831                                       |
| 487                        | 35.891  |
| 2770                       | 2,786.940                                     |
| 2778                       | 604.306                                       |
| 5232                       | 16.355  |

# **TABLE 2.2.1.3.1** **BASELINE ENERGY** **CONSUMPTION ECO-3**

| BUILDING<br>NUMBER | BASELINE ENERGY<br>CONSUMPTION (MBTU) |
|--------------------|---------------------------------------|
| 86                 | 23.770                                |
| 94                 | 445.640                               |
| 158                | 220.960                               |
| 159                | 820.250                               |
| 2770               | 1,150.044                             |
| 2730               | 193.800                               |
| 2778               | 399.321                               |
| 2942               | 108.940                               |
| 2943               | 108.940                               |
| 2944               | 207.970                               |
| 2963               | 58.140                                |
| 2969               | 58.140                                |
| 2970               | 58.140                                |
| 2971               | 58.140                                |
| 2972               | 58.140                                |
| 2973               | 58.140                                |
| 2974               | 58.140                                |
| 2979               | 58.140                                |
| 2980               | 58.140                                |
| 5220               | 1,016.730                             |
| 5222               | 331.880                               |
| 5253               | 248.910                               |
| 5256               | 1,578.610                             |

## 2 METHODS AND APPROACH

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### 2.2.1.4 Baseline Energy Consumption: ECO - 4

The baseline energy consumption for this ECO was calculated using a LOTUS123 spreadsheet. This spreadsheet modeled the energy consumption of the existing lighting system by utilizing the following:

1. Existing fixture and lamp type (i.e. fluorescent, mercury vapor, etc.)
2. Lamp wattage.
3. Ballast wattage.
4. Hours of use.

The above information was obtained during the field survey. *Table 2.2.4.1* lists the baseline energy consumption for this ECO.

**TABLE 2.2.1.4.1**  
**BALLFIELD LIGHTING**  
**BASELINE ENERGY CONSUMPTION**

| ECO<br>NUMBER | BALLFIELD<br>NUMBER | BALLFIELD<br>NAME           | BASELINE ENERGY<br>CONSUMPTION (MBTU) |
|---------------|---------------------|-----------------------------|---------------------------------------|
| 4.1           | 2358                | GARY OWENS REGIMENT         | 127.745                               |
| 4.1           | 2388 N              | BLACK HORSE/ HELL ON WHEELS | 154.36                                |
| 4.1           | 2388 S              | BLACK HORSE/ HELL ON WHEELS | 149.04                                |
| 4.2           | 2358                | GARY OWENS REGIMENT         | 33.915                                |
| 4.2           | 2388 N              | BLACK HORSE/ HELL ON WHEELS | 38.096                                |
| 4.2           | 2388 S              | BLACK HORSE/ HELL ON WHEELS | 34.181                                |
| 4.2           | 4557                | KEYS PARK                   | 148.56                                |
| 4.2           | 5913                | DISNEY AREA                 | 148.121                               |
| 4.2           | 6532                | 2ND DRAGON/BACHLER          | 106.342                               |
| 4.2           | 6609                | TURRETT FIELD               | 274.306                               |
| 4.2           | 6647                | EAST-WEST                   | 185.736                               |



## 2 METHODS AND APPROACH

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### 2.3 ENERGY CONSERVATION OPPORTUNITIES

Systems Corp analyzed four distinct energy conservation opportunities (ECOs) at Fort Knox, Kentucky. The analysis was performed utilizing energy models developed by Systems Corp and data collected during the field survey of the facilities at Fort Knox. Each ECO was evaluated to determine the potential energy savings, dollar savings, implementation costs, simple payback, life cycle cost and savings to investment ratio (SIR). The four ECOs that were evaluated are as follows:

ECO - 1 Ceiling Reflectance

ECO - 2 High Efficiency Indoor Lighting

ECO - 3 Indoor Lighting Controls

ECO - 4 Ballfield Lighting and Controls

Systems Corp's energy analysis models were used to determine the savings achieved for implementing each ECO in the facilities that were evaluated. The U.S Army Corp of Engineers M-CACES software was utilized to estimate the implementation cost of each ECO in each facility evaluated. The U.S Army Corp of Engineers Life Cycle Cost in Design, Version 1.0, Level 72, software was used to perform life cycle cost analyses and determine the SIR of each ECO for each facility evaluated.

#### 2.3.1 ECO - 1: Ceiling Reflectance

This ECO evaluated the use of a spray-applied acoustical insulation. The objective was to increase the reflectance value of the ceiling as well as improve the ceiling's insulation value. The energy savings were based on the heating system savings due to the added insulation. The calculations for this ECO were performed using weather bin data field notes and manufacturer's data. It is estimated the spray-applied acoustical insulation will cost between \$.60 and \$.80 per square foot for material and labor. It was determined based on the energy savings and current roof and ceiling conditions that no building will meet the required twenty (20) years or less simple payback. No life cycle cost analysis or cost estimate were performed.

## 2 METHODS AND APPROACH

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### 2.3.2 ECO - 2: High Efficiency Indoor Lighting

Many options were available which would fulfill this ECO. The goal was to increase the lighting efficiency in the buildings as much as possible while still being cost effective. The following is a list and description of the options implemented in the buildings. All options are not evaluated in all buildings due to applicability.

1. *Four (4) Foot Fluorescent Fixtures:* Replace existing T12 lamps with T8 lamps and electronic ballasts. Reflectors are used in some fixtures to reduce the required number of lamps. This is a one-for-one fixture replacement.
2. *Eight (8) Foot Fluorescent Fixtures:* Replace existing fixtures with high pressure sodium fixtures. The number of fixtures are reduced while maintaining or increasing the lighting levels to the recommended settings.
3. *Incandescent Lighting:* Existing incandescents are replaced with T8 fluorescent lamps and electronic ballasts or high pressure sodium fixtures.
4. *Mercury Vapor Fixtures:* Existing mercury vapor fixtures are replaced with high pressure sodium fixtures. This is a one-for-one replacement.

### 2.3.3 Indoor Lighting Controls

The objective in this ECO was to reduce the hours required to operate the building lighting system while maintaining the required light levels. The buildings evaluated under this ECO receive significant daylighting through highbay doors or building windows for at least six (6) months throughout of the year. The amount of daylight available to the Fort Knox area was determined using the Climatological Data. All options are not evaluated in all buildings due to applicability. The following is a list and a description of the options implemented in the buildings.

1. *On/Off Photocell Control:* Based on the light readings obtained during the field survey, a quantity of fixtures were identified to be controlled by photocells. If a photocell indicates the recommended light level is being contributed by the daylight, the lighting fixtures controlled by the photocell will turn off automatically.

## 2 METHODS AND APPROACH

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2. *Dimming and On/Off Photocell Controls:* This option is the same as Option 1 except the lighting fixtures not controlled by the on/off photocells can be controlled by a dimming system. This second option allows for an additional amount of savings due to the available daylighting. The dimming fixtures will also be controlled by a photocell. In addition, the dimming system will allow those fixtures to be reduced to a 60% energy load when the necessary daylight is available.

### 2.3.4 ECO - 4: Ballfield Lighting and Controls

This ECO evaluated two (2) savings opportunities. The goal for ECO-4.1 was to increase the lighting efficiency at the ballfields as much as possible while still being cost effective. All ballfields were evaluated to use metal halide fixtures to replace the existing lighting system. It was assumed the ballfield lighting systems operate approximately 1,040 hours each year. ECO-4.2 evaluated the use of a control system on the ballfield lights. The following describes the controls evaluated for ECO-4.2:

1. *Photocell:* A photocell would eliminate the unnecessary use of the ballfield lighting system during daylight hours.
2. *Four (4) Hour Timer:* A timer would reduce the unnecessary use of the ballfield lighting system during night time hours.

# facility

INTERIOR/BALLFIELD LIGHTING REPLACEMENT AND  
LIGHTING CONTROL INSTALLATION  
Fort Knox, Kentucky

## project coordinator for using service

Gary Meredith

functional requirements summary, PDB-1

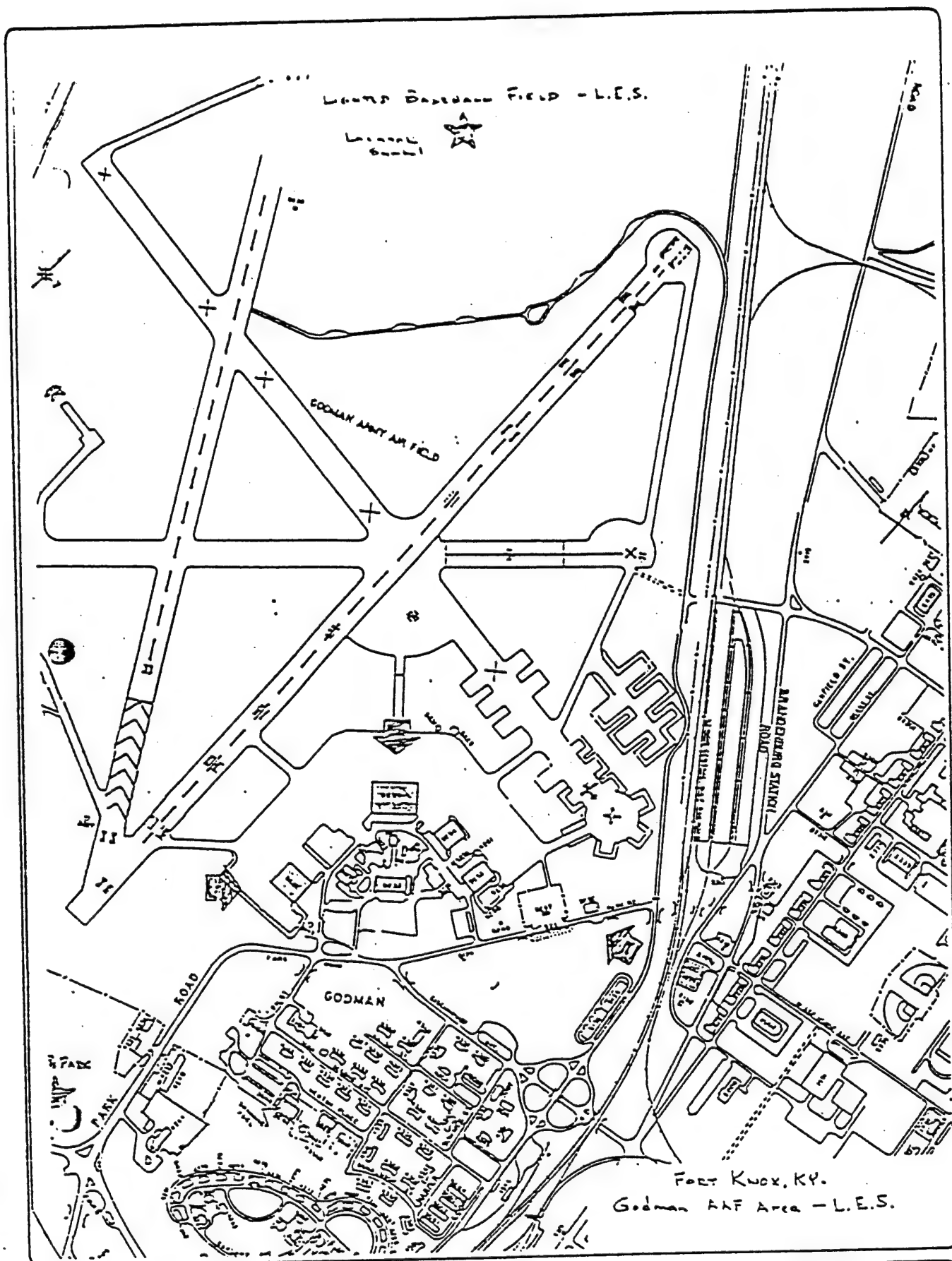
3-1

**OBJECTIVE:**

The objective of this project is to install lighting controls and replace existing interior and ballfield lighting with higher efficiency fixtures and lamps. The installation of controls and replacement of the existing lighting will reduce energy consumption and life cycle operating costs for the subject facilities in accordance with the Army Energy Resources Management Plan (ERMP) and Executive Order 12759.

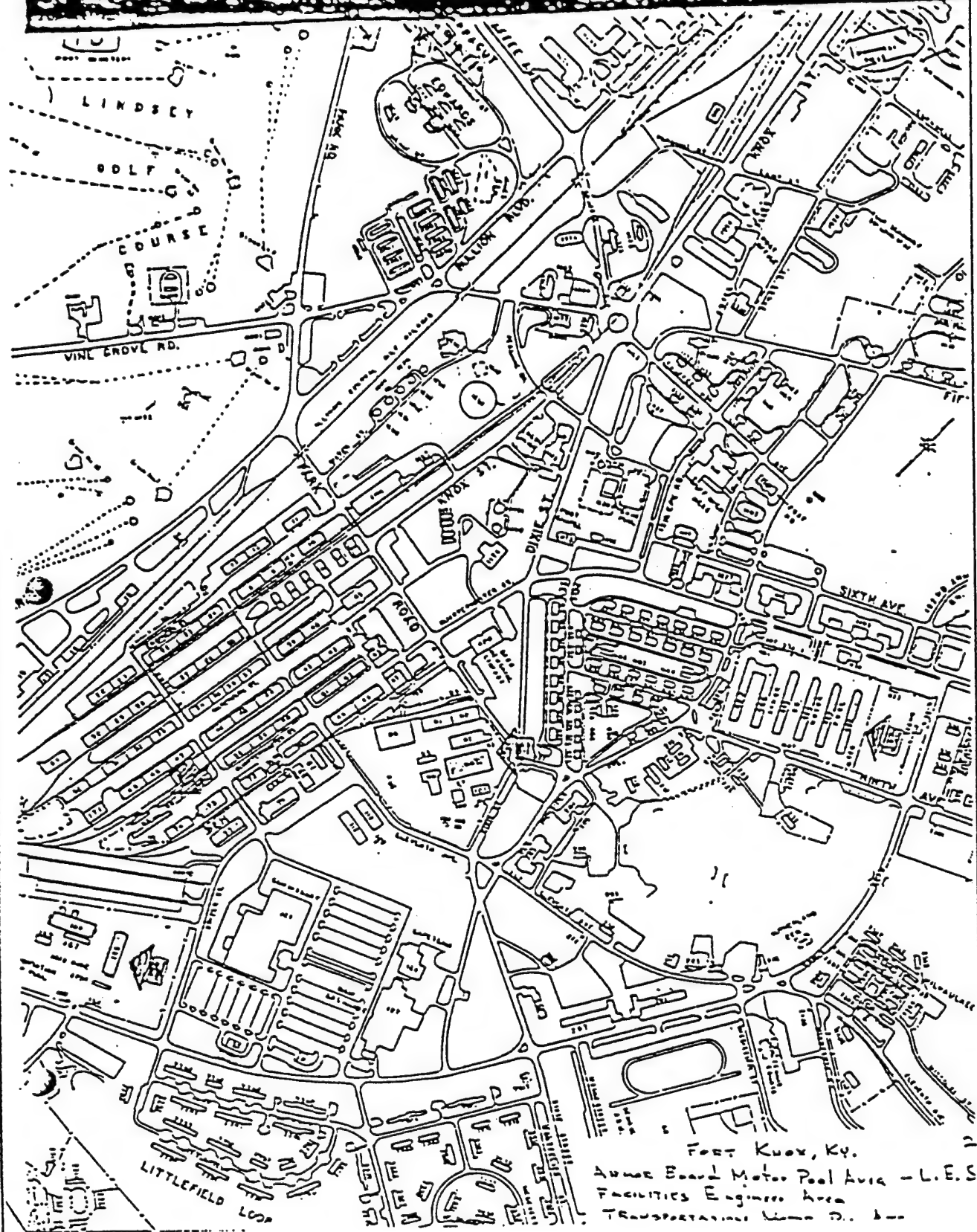
functional requirements summary, PDB-1

13-2



facilities requirements sketch, PDB- 1/2

3-3



facilities requirements sketch, PDB- 1/2

3-4

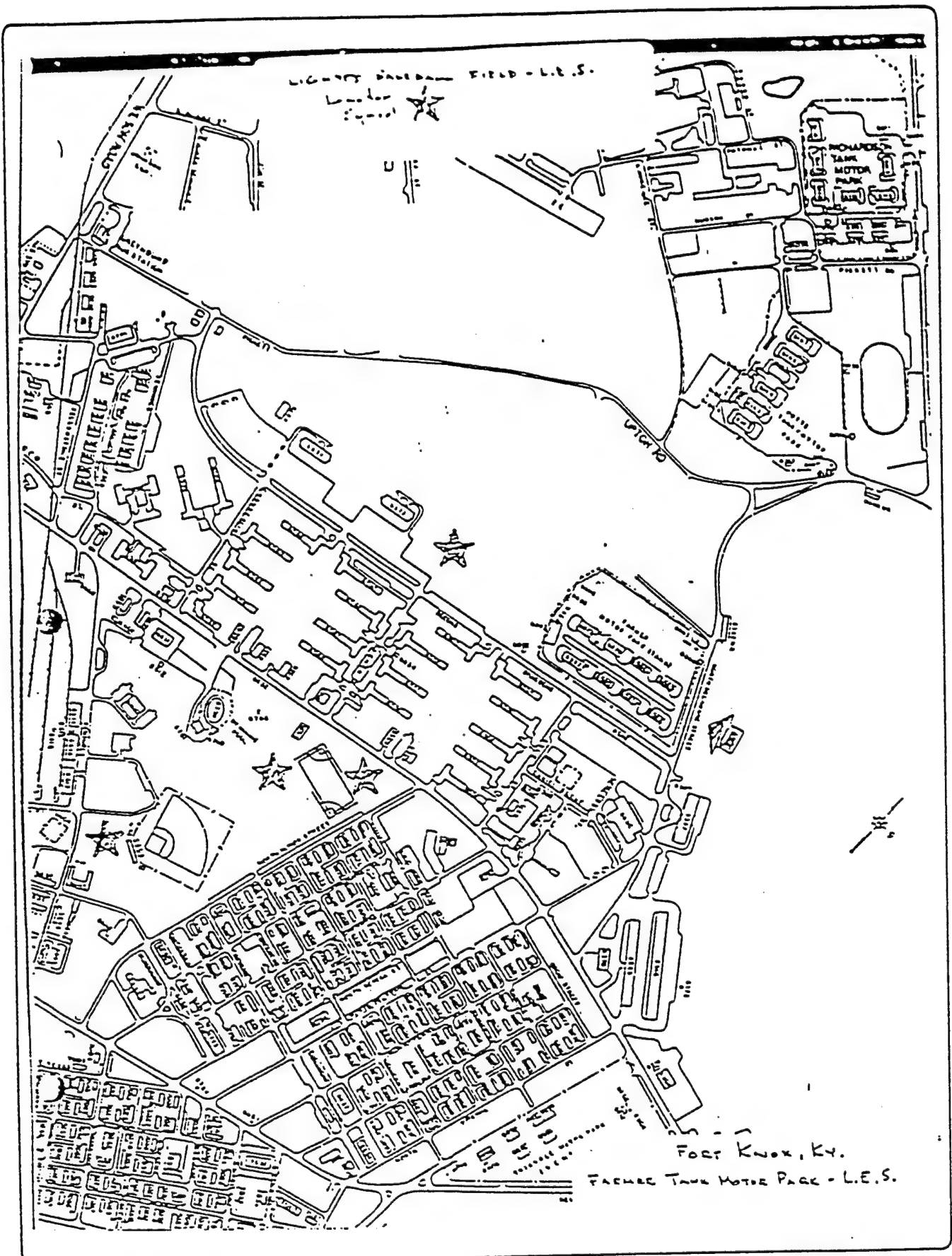






facilities requirements sketch, PDB- 1/2

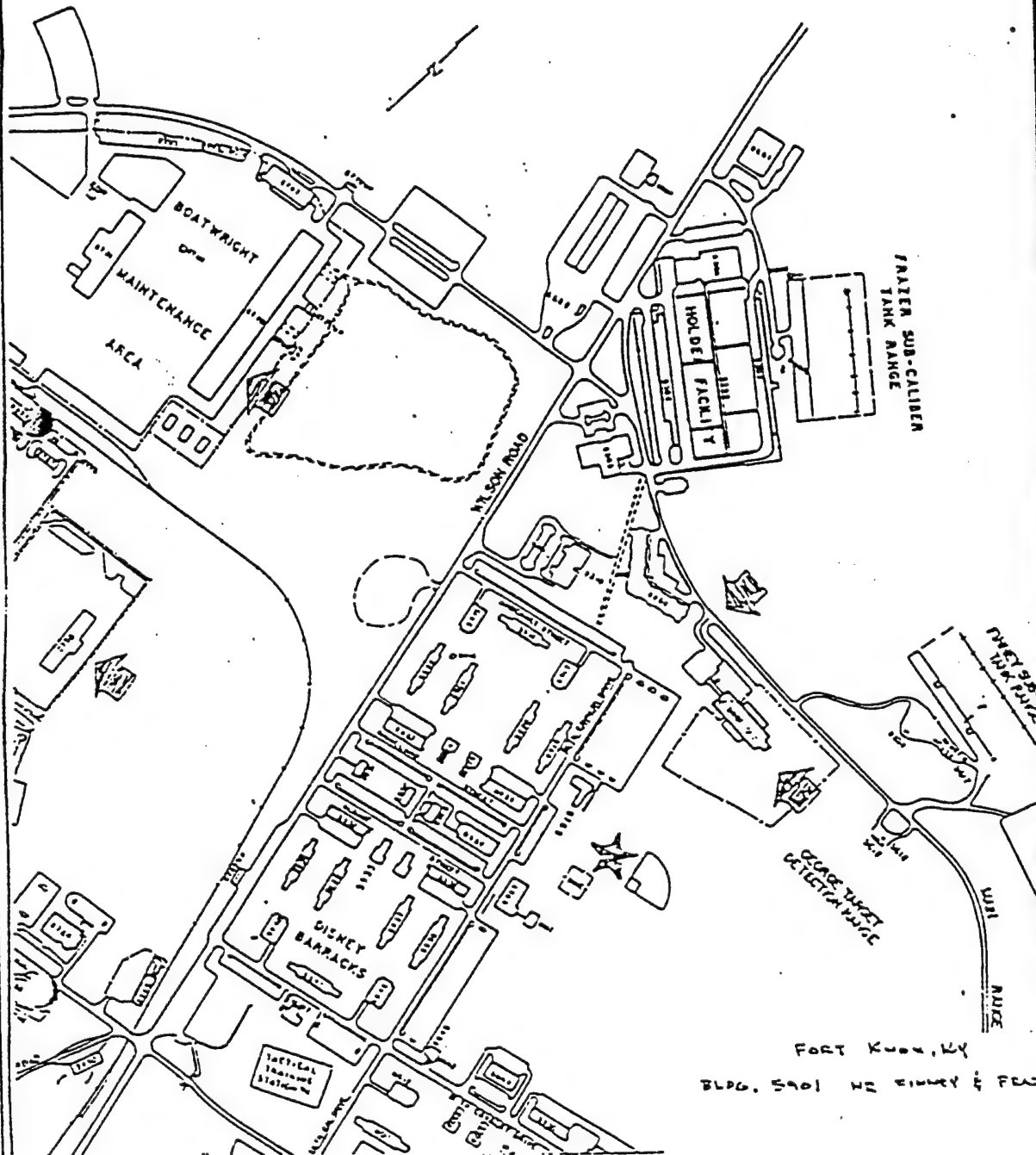
3-6



facilities requirements sketch, PDB- 1/2

3-7

Licensed Ballroom Field - L.E.S.



FORT KNOX, KY

BLDG. 5401 HQ ENGINE & POWER-LE

facilities requirements sketch, PDB- 1/2

3-8

APPENDIX C  
DOCUMENTATION CHECKLIST

## A. SPECIAL CONSIDERATIONS

| ITEM   |  |
|--|--|
| A-1  | Cost estimates for each primary and supporting facility  |
| A-2  | Telecommunications system coordination with USACC and authorization for exceptions   |
| A-3  | Coordination with state and local governmental requirements (blind vendors, medical facilities, construction and operating permits, clearinghouse coordination, etc.)          |
| A-4  | Assignment of airspace   |
| A-5  | Economic analysis of alternatives  |
| A-6  | Approval for new starts  |
| A-7  | International balance of payments (IBOP) coordination with U.S. European command and NATO—overseas cost estimates and comparables (include rate of exchange used in estimates) |
| A-8  | Impact on historic places—on site survey by authorized archeologist and coordination with state historic preservation officer and advisory council on historic preservation    |
| A-9  | Exceptions to established criteria   |
| A-10   | Coordination with various staff agencies (Provost Marshall-physical security, etc.)  |
| A-11   | Identification of related or support projects (so projects can be coordinated)   |
| A-12   | Required completion date   |
| Other Special Considerations (List and number items) |  |
| 1. See Appendix A                                    |  |

| Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|--------------------------|------------------|------------------|-------------------|
| R                        | D                |                  | 1                 |
| NR                       |                  |                  |                   |
| R                        | A                |                  |                   |
| NR                       |                  |                  |                   |
| R                        | D                |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| R                        |                  |                  |                   |
| R                        |                  |                  |                   |
| R                        |                  |                  |                   |

**REQUIRED OR NOT REQUIRED** — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

**TO BE DETERMINED** — Information needed but not currently available. Enter code for information source.

**COMMENT ATTACHED** — Significant information summarized or explained and attached.

**DOCUMENT ATTACHED** — Significant information is in an existing document which is attached.

\* BY WHOM (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

# documentation checklist

3-10

## B. SITE DEVELOPMENT

| ITEM |   | Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|------|---|--------------------------|------------------|------------------|-------------------|
| B-1  | Consultation with the District Office to determine and evaluate flood plain hazards   | NR                       |                  |                  |                   |
| B-2  | Preparation, submission, and/or approval of new                                       | NR                       |                  |                  |                   |
| (A)  | General Site Plan   | NR                       |                  |                  |                   |
| (B)  | Annotated General Site Plan   | NR                       |                  |                  |                   |
| (C)  | Sketch Site Plan  | R                        |                  |                  |                   |
| (D)  | Facilities Requirements Sketch  |                          |                  |                  |                   |
| B-3  | Preparation of  | NR                       |                  |                  |                   |
| (A)  | Site Survey   | NR                       |                  |                  |                   |
| (B)  | Subsoil Information   |                          |                  |                  |                   |
| B-4  | Approval by Department of Defense Explosive Safety Board (DDESB) for Safety Site Plan | NR                       |                  |                  |                   |
|      | Other Site Development Considerations (List and number items)                         |                          |                  |                  |                   |
|      | 1. See Project Development Brochure, PDB-1/2  |                          |                  |                  |                   |

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- E — Other (Check Comments Attached and explain)

# documentation checklist

3-11

### C. ARCHITECTURAL & STRUCTURAL

## ITEM.

|      |  |
|------|--|
| C-1  | Reconciliation with troop housing programs and requirements  |
| C-2  | Evaluation of existing facilities (including degree of utilization)  |
| C-3  | Approval for removal and relocation of existing useable facilities   |
| C-4  | Evaluation of off-post community facilities  |
| C-5  | Storage and maintenance facilities (including nuclear weapons)   |
| C-6  | Coordination hospitals, medical and dental facilities with Surgeon General   |
| C-7  | Coordination of aviation facilities with FAA   |
| C-8  | Coordination air traffic control and navigational aids with USACC  |
| C-9  | Tabulation of types and numbers of aircraft  |
| C-10 | Evaluation of laboratory, research and development, and technical maintenance facilities   |
| C-11 | Coordination chapels with Chief of Chaplains   |
| C-12 | Review food service facilities by USATSA   |
| C-13 | Automated data processing system or equipment approvals—cost analysis when ADP and/or communication centers not co-located with related facilities |
| C-14 | Coordination postal facilities with U.S. Postal Service Regional Director  |
| C-15 | Laundry and dry cleaning facilities coordination with ASD (I&L)  |
| C-16 | Tenant facilities coordination with Installation where sited   |
| C-17 | Facilities for or exposed to explosions, toxic chemicals, or ammunition—review by DDESB (See also Item B-4)  |
| C-18 | Analysis of deficiencies   |
| C-19 | Consideration of alternatives  |
| C-20 | Determination whether occupants will include physically handicapped or disabled persons  |
| C-21 | As-built drawings for alterations or additions   |
| C-22 | Availability of Standard Design or site adaptable designs  |

Other Architectural & Structural (List and number items)

1. See Supplemental Data  
Detailed Project Justification  
Paragraph D3.
2. See Supplemental Data  
Detailed Project Justification  
Paragraph D4.

| Regulated or<br>Not Regulated | To Be<br>Determined | Comment<br>Attached | Document<br>Attached |
|-------------------------------|---------------------|---------------------|----------------------|
| NR                            |                     |                     |                      |
| R                             | D                   |                     | 1                    |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| NR                            |                     |                     |                      |
| R                             | D                   |                     | 1                    |
| R                             | D                   |                     | 2                    |
| NR                            |                     |                     |                      |
| R                             | C                   |                     |                      |
| NR                            |                     |                     |                      |

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Enter code for information source.

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\* BY WHOM (Check and insert appropriate letter)

- A - DFAE  
B - Using Service  
C - Construction Service  
D - Designer  
E - Other (Check Comments Attached and explain)

## documentation checklist

3-12

## D. MECHANICAL, ELECTRICAL, & UTILITY SYSTEMS

| ITEM   |  | Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|--|--|--------------------------|------------------|------------------|-------------------|
| D-1  | Fuel considerations and cost comparison analysis       | R                        | D                |                  |                   |
| D-2  | Energy requirements appraisal (ERA)                    | R                        | D                |                  | 1                 |
| D-3  | Conformance with DOD Energy Reduction requirements     | R                        | D                |                  |                   |
| D-4  | Evaluation of existing and/or proposed utility systems | R                        | D                |                  |                   |
| Other Mechanical and Utility Systems (List and number items) |  |                          |                  |                  |                   |
| 1. See Special Requirements, Paragraph 3 (SRP-3)             |  |                          |                  |                  |                   |

**REQUIRED OR NOT REQUIRED** — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

# documentation checklist

3-13



## E. ENVIRONMENTAL CONSIDERATIONS

| ITEM  |  |
|---|--|
| E-1   | Environmental impact assessment  |
| E-2   | EIA conclusions require Environmental Impact Statement   |
| E-3   | Determination of health, environmental or related hazards. Assistance to determine existence of any health, environmental or related hazard may be requested from Aberdeen Proving Ground, MD 21010, the Office of the Surgeon General, Attn: DASG-HCH (Army Environmental Hygiene Agency) |
| E-4   | Air/water pollution permit, coordination with agencies and compliance with standards at Federal, state and local level   |
| E-5   | Corrective measures associated with Environmental Impact Statements or assessment—list separately and evaluate.  |
| Other environmental considerations (list and number items)                  |  |
| 1. See Supplemental Data<br>Detailed Project Justification<br>Paragraph D9. |  |

| Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|--------------------------|------------------|------------------|-------------------|
| R                        | D                |                  | 1                 |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |

**REQUIRED OR NOT REQUIRED** — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

# documentation checklist

3-14

APPENDIX D  
TECHNICAL DATA CHECKLIST

## A. SPECIAL CONSIDERATIONS

| ITEM   |  | Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|--|--|--------------------------|------------------|------------------|-------------------|
| A-1  | Factor of risk, restriction or unusual circumstance expected to increase costs beyond applicable area averages   | NR                       |                  |                  |                   |
| A-2  | Construction phasing requirements  | R                        | D                |                  |                   |
| A-3  | Functional support equipment (mechanical, electrical, structural, and security) to be built in   | NR                       |                  |                  |                   |
| A-4  | Equipment in place and justification   | NR                       |                  |                  |                   |
| A-5  | Other equipment and furniture (O&MA, OPA) and costs  | NR                       |                  |                  |                   |
| A-6  | Special studies and tests (hazards analyses, compatibility testing, new technology testing, etc.)  | NR                       |                  |                  |                   |
| A-7  | Type of construction (permanent, temporary, semi-permanent)  | NR                       |                  |                  |                   |
| A-8  | Government furnished equipment (quantities, procurement time, availability and special handling and storage requirements). Funds used for procurement. | NR                       |                  |                  |                   |
| Other special considerations (list and number items) |  |                          |                  |                  |                   |

**REQUIRED OR NOT REQUIRED** — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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**\* BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

# technical data checklist

3-16

## B. SITE DEVELOPMENT

| ITEM  |  | Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|---|--|--------------------------|------------------|------------------|-------------------|
| B-1   | Construction restrictions or guidelines pertaining to site access and preferred construction routes          | R                        | A                |                  |                   |
| (A)   |  |                          |                  |                  |                   |
| (B)   | Airfield clearance, explosive storage, working hours, safety, etc.   | NR                       |                  |                  |                   |
| (C)   | Facilities and/or functions of adjoining areas (structures, materials, impact)                               | R                        | A                |                  |                   |
| B-2   | Real estate actions (acquisition, disposal, lease, right-of-way)   | NR                       |                  |                  |                   |
| B-3   | Demolition/relocation required (data)  |                          |                  |                  |                   |
| (A)   | Special considerations due to explosives/radioactivity/chemical contamination/asbestos emissions/toxic gases | R                        | A                | 1                |                   |
| (B)   | Restrictions on disposal of demolished/relocated material including hazardous waste                          | NR                       |                  |                  |                   |
| B-4   | Pavement types and requirements (including traffic surveys and MTMC coordination)                            | NR                       |                  |                  |                   |
| B-5   | Landscape considerations   |                          |                  |                  |                   |
| (A)   | Protection of existing vegetation  | R                        | A                |                  |                   |
| (B)   | Stockpile topsoil  | NR                       |                  |                  |                   |
| Other Site Development (List and number items)  |  |                          |                  |                  |                   |
| 1. There is a possibility that the existing lighting may contain PCB's in the ballasts. |  |                          |                  |                  |                   |

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**\*BY WHOM** (Check and insert appropriate letter)

A - DFAE

B - Using Service

C - Construction Service

D - Designer

E - Other (Check Comments Attached and explain)

# technical data checklist

3-17

## C. ARCHITECTURAL & STRUCTURAL

### ITEM

- |     |   |
|-----|---|
| C-1 | Vibration-producing equipment requiring isolation   |
| C-2 | Seismic zone and other design load criteria (typhoon, hurricane, earthquake loads, high or low loss potential)                  |
| C-3 | Protective shelter evaluation and resistant design criteria (conventional/nuclear blast and radiation, chemical/biological)     |
| C-4 | Unusual foundation requirements (pier, pile, caisson, deep foundations, mat, special treatment, permafrost areas, soil bearing) |
| C-5 | Designation and strength of units to be accommodated  |
| C-6 | Requirements and data for special design projects   |
| C-7 | Unusual floor and roof loads (water, equipment)   |
| C-8 | Security features (arms rooms, vaults, interior secure areas)   |
|     | Other Architectural & Structural (List and number items)  |

| Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|--------------------------|------------------|------------------|-------------------|
| R                        | D                |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |

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**BY WHOM** (Check and insert appropriate letter)

- A — DFAE
- B — Using Service
- C — Construction Service
- D — Designer
- E — Other (Check Comments Attached and explain)

# technical data checklist

3-18

# D. MECHANICAL, ELECTRICAL & UTILITY SYSTEMS

## ITEM

|      |  |
|------|--|
| D-1  | Special mechanical requirements or considerations (elevator, crane, hoist, etc.)   |
| D-2  | Special peak usage periods and peak leveling techniques  |
| D-3  | Maintenance considerations (accessibility of equipment, compatibility with existing equipment)   |
| D-4  | Plumbing—availability, general system type and characteristics (proposed and/or existing, incl. compressed air and gas)                  |
| D-5  | Heating—availability, general system type and characteristics (proposed and/or existing)   |
| D-6  | Ventilating, air condition/refrigeration—availability, general system type and characteristics (proposed and/or existing)                |
| D-7  | Electrical—availability, general system type and characteristics incl. airfield lighting, communication, etc. (proposed and/or existing) |
| D-8  | Water supply/waste treatment—availability, general system type and characteristics (proposed and/or existing)                            |
| D-9  | Energy requirements/fuel conversion (sources, availability, loads, types of fuel, etc.)  |
| D-10 | Solar energy evaluation  |
|      | Other Mechanical & Utility Systems (List and number items)   |

| Required or Not Required | To Be Determined | Comment Attached | Document Attached |
|--------------------------|------------------|------------------|-------------------|
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| R                        | D                |                  |                   |
| R                        | D                |                  |                   |
| NR                       |                  |                  |                   |
| R                        | D                |                  |                   |
| NR                       |                  |                  |                   |
| NR                       |                  |                  |                   |
| R                        | D                |                  |                   |
| NR                       |                  |                  |                   |

**REQUIRED OR NOT REQUIRED** — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

**TO BE DETERMINED** — Information needed but not currently available. Enter code for information source.

**COMMENT ATTACHED** — Significant information summarized or explained and attached.

**DOCUMENT ATTACHED** — Significant information is in an existing document which is attached.

**\* BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

# technical data checklist

'3-19

## E. ENVIRONMENTAL CONSIDERATIONS

| ITEM |   | Required or<br>Not Required | To Be<br>Determined | Comment<br>Attached | Document<br>Attached |
|------|---|-----------------------------|---------------------|---------------------|----------------------|
| E-1  | Waste water treatment, air quality, and solid waste disposal criteria | NR                          |                     |                     |                      |
|      | Other Environmental Considerations (List and number items)            |                             |                     |                     |                      |

**REQUIRED OR NOT REQUIRED** — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

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A — DFAE

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D — Designer

E — Other (Check Comments Attached and explain)

# technical data checklist

3-20

## F. FIRE PROTECTION

### ITEM

F.1

Special fire protection systems or features (detection and suppression equipment, hazards, etc.)

Other Fire Protection Considerations (List and number items)

Required or  
Not Required

To Be  
Determined

Comment  
Attached

Document  
Attached

NR

**REQUIRED OR NOT REQUIRED** — Not relevant or no information to communicate. Enter "R" if item is relevant and is required for this project. Enter "NR" if item is irrelevant and is not required for this project.

**TO BE DETERMINED** — Information needed but not currently available. Enter code for information source.

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**• BY WHOM** (Check and insert appropriate letter)

A — DFAE

B — Using Service

C — Construction Service

D — Designer

E — Other (Check Comments Attached and explain)

# technical data checklist

3-21



|  |   |  |                                  |                           |                 |
|--|---|--|----------------------------------|---------------------------|-----------------|
| 1. COMPONENT<br>ARMY   | <b>FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA</b> |  |                                  | 2. DATE<br>05 November 93 |                 |
| 3. INSTALLATION AND LOCATION<br>Fort Knox, Kentucky  |   | 4. PROJECT TITLE<br>INTERIOR/BALLFIELD LIGHTING<br>REPLACEMENT AND LIGHTING CONTROL INSTALLATION |                                  |                           |                 |
| 5. PROGRAM ELEMENT   | 6. CATEGORY CODE  | 7. PROJECT NUMBER<br>ECIP #1   | 8. PROJECT COST (\$000)<br>\$411 |                           |                 |
| 9. COST ESTIMATES  |   |  |                                  |                           |                 |
| ITEM   |   | U/M  | QUANTITY                         | UNIT<br>COST              | COST<br>(\$000) |
| Primary Facility   |   |  |                                  |                           |                 |
| Interior and Exterior Light Fixtures and Controls  |   | Lot  | 1                                | \$355,794                 | \$356           |
| Subtotal   |   |  |                                  |                           | \$356           |
| Contingency (10%)  |   |  |                                  |                           | \$36            |
| Total Contract Cost  |   |  |                                  |                           | \$392           |
| Supervision, Inspection and Overhead (5.0%)  |   |  |                                  |                           | \$19            |
| Total Request  |   |  |                                  |                           | \$411           |
| <p>10. DESCRIPTION OF PROPOSED CONSTRUCTION</p> <p>The existing interior lighting is a combination of standard efficiency fluorescent fixtures, incandescents, and mercury vapor. The existing ballfield lighting is a combination of incandescents and quartz. The proposed project will replace the interior lighting fixtures with T-8's fluorescents and high efficiency electronic ballasts or high pressure sodium fixtures. The implementation of this project will save 5436 MBtu/Yr of electrical energy. The first year savings is \$93,956 and the Savings to Investment Ratio (SIR) is 2.61.</p> <p>11. REQUIREMENT</p> <p>Project: The proposed interior ballfield lighting and light control project replaces sixteen (16) buildings and three (3) ballfield locations lighting with energy efficient lighting and installs lighting controls at twenty-three (23) buildings and (8) ballfields.</p> <p>Requirement: The project is required to reduce the energy consumption of lighting and to comply with the Army Energy Resources Management Plan (ERMP) and Executive Order 12759. The proposed project will reduce annual energy consumption by 5736 MBTU/YR and annual energy cost by \$93,956</p> <p>Current Situation: The existing lighting in building numbers T58, T59, T60, 63, 73, 86, 92, 482-487, 2770, 2778, 5232, and ballfields 2358, 2388N and 2388S is inefficient fluorescent, incandescent, quartz and mercury vapor. The controls at buildings 86, 94, 158 159, 2770, 2730, 2778, 2942-2944, 2963, 2969-2974, 2979, 2980, 5220, 5222, 5253, 5256 and ballfields 2358, 2358N, 2388S, 4557, 5913, 6532, 6609, and 6647 are on/off switches.</p> |   |  |                                  |                           |                 |

|   |  |                              |                           |                               |              |        |                                     |            |        |                                    |               |        |
|---|--|------------------------------|---------------------------|-------------------------------|--------------|--------|-------------------------------------|------------|--------|------------------------------------|---------------|--------|
| 1. COMPONENT<br>ARMY  | FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA |                              | 2. DATE<br>05 November 93 |                               |              |        |                                     |            |        |                                    |               |        |
| 3. INSTALLATION AND LOCATION<br>Fort Knox, Kentucky   |  |                              |                           |                               |              |        |                                     |            |        |                                    |               |        |
| 4. PROJECT TITLE<br>INTERIOR/BALLFIELD LIGHTING REPLACEMENT<br>AND LIGHTING CONTROL INSTALLATION  |  | 5. PROJECT NUMBER<br>ECIP #1 |                           |                               |              |        |                                     |            |        |                                    |               |        |
| <p>Impact if not provided: If the proposed project is not funded, a reduction of 5725 MBtu/YR cannot be achieved, and excessive amounts of energy will continue to be used. There will be no contribution to energy reduction goals established for United States Army facilities by Army Headquarters.</p> <p style="text-align: center;">_____<br/>Colonel, USA<br/>Commanding</p> <table> <tr> <td>ESTIMATED CONSTRUCTION START:</td> <td>October 1994</td> <td>INDEX:</td> </tr> <tr> <td>ESTIMATED MIDPOINT OF CONSTRUCTION:</td> <td>April 1995</td> <td>INDEX:</td> </tr> <tr> <td>ESTIMATED CONSTRUCTION COMPLETION:</td> <td>November 1995</td> <td>INDEX:</td> </tr> </table> <p style="text-align: center;">DETAILED JUSTIFICATIONS</p> <p>D1. GENERAL</p> <p>The proposed project encompasses the replacement of lighting in sixteen (16) buildings and three (3) ballfields, and installation of lighting controls in twenty-three (23) buildings and eight (8) ballfields. The project will decrease the energy consumption of the lighting system without reducing light levels except where necessary.</p> <p>D2. ACCOMMODATIONS NOW IN USE:</p> <p>The existing lighting systems are comprised of standard efficiency fluorescent, incandescent, quarts, and mercury vapor fixtures.</p> <p>D3. ANALYSIS OF DEFICIENCY:</p> <p>Currently, sixteen (16) buildings and three (3) ball fields are using standard or low efficiency fixtures for lighting. The purpose of this project is to replace the existing lighting with new light fixtures which are much more efficient, and install lighting controls at twenty-three (23) buildings and eight (8) ballfields. The current deficiency results in large amount of energy usage to maintain adequate lighting.</p> |  |                              |                           | ESTIMATED CONSTRUCTION START: | October 1994 | INDEX: | ESTIMATED MIDPOINT OF CONSTRUCTION: | April 1995 | INDEX: | ESTIMATED CONSTRUCTION COMPLETION: | November 1995 | INDEX: |
| ESTIMATED CONSTRUCTION START:   | October 1994                                       | INDEX:                       |                           |                               |              |        |                                     |            |        |                                    |               |        |
| ESTIMATED MIDPOINT OF CONSTRUCTION:   | April 1995   | INDEX:                       |                           |                               |              |        |                                     |            |        |                                    |               |        |
| ESTIMATED CONSTRUCTION COMPLETION:  | November 1995                                      | INDEX:                       |                           |                               |              |        |                                     |            |        |                                    |               |        |

|  |  |                              |                           |
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| 1. COMPONENT<br>ARMY   | FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA |                              | 2. DATE<br>05 November 93 |
| 3. INSTALLATION AND LOCATION<br>Fort Knox, Kentucky  |  |                              |                           |
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| <p>D4. CONSIDERATION OF ALTERNATIVES:</p> <p>The only alternatives to proposed project are to install lower efficiency light fixtures. The disadvantages of using lower efficiency light fixtures is that less energy savings can be realized without significantly reducing the construction cost. If a less efficient light fixture is selected, the project would have a lower SIR.</p> <p>D5. CRITERIA FOR PROPOSED PROJECT:</p> <p>The proposed project will conform with all applicable federal and United States Army Regulations.</p> <p>D6. PROGRAM FOR RELATED EQUIPMENT:</p> <p>No equipment funded from appropriations other than MCA are required.</p> <p>D7. DISPOSAL OF PRESENT ASSETS:</p> <p>Light fixtures in sixteen (16) buildings and three (3) ballfields will be disposed.</p> <p>D8. SURVIVAL FACILITIES:</p> <p>The proposed project is not suitable for inclusion of protective shelters.</p> <p>D9. SUMMARY OF ENVIRONMENTAL CONSEQUENCES:</p> <p>The proposed project has been analyzed and will not adversely impact the environment. Energy savings resulting from the project will conserve natural resources.</p> <p>D10. EVALUATION OF FLOOD HAZARDS AND ENCROACHMENT ON WETLANDS:</p> <p>It has been determined that these facilities are not located in a flood plain and they do not encroach on wetlands.</p> <p>D11. ECONOMIC JUSTIFICATION:</p> <p>The proposed project qualifies under ECIP Guidelines in AR-415-15. SIR for the project is 2.61 with a simple payback of 4.37 years. See Economic Analysis, SRP-1</p> |  |                              |                           |

|  |  |                              |                           |
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| 1. COMPONENT<br>ARMY   | FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA |                              | 2. DATE<br>05 November 93 |
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| <p>D12. UTILITY AND COMMUNICATION SUPPORT:</p> <p>A. No related utility support projects are programmed. Adequate utilities are available to support the project.</p> <p>B. No telecommunication support is required.</p> <p>D13. PROTECTION OF HISTORIC PLACES AND ARCHEOLOGICAL SITES:</p> <p>The project involves the replacement of light fixtures located in existing buildings and family housing areas. Review procedures have been implemented for this project in accordance with 36 CFR 800. The review has established that there will be no effect.</p> <p>D14. PROJECT DEVELOPMENT BROCHURE (PART 1):</p> <p>A Project Development Brochure was prepared on 05 November 93 and is attached as a part of the programming documentation.</p> <p>D15. ENERGY REQUIREMENTS:</p> <p>The proposed project will reduce present energy consumption by 5436 MBtu/Yr at the cost savings of \$93,956 per year. See Energy Requirements Appraisal (ERA) in Special Requirements, Paragraph 3 (SRP-3).</p> <p>D16. PROVISION FOR THE HANDICAPPED:</p> <p>No provisions for the handicapped will be made since the scope of the project is in no way applicable to designing for the handicapped.</p> <p>D17. REAL PROPERTY MAINTENANCE ACTIVITY (RPMA) ANALYSIS:</p> <p>A. Physical impact: There will be light fixtures removed and replace by the same number of light fixtures. No new structures will be added.</p> |  |                              |                           |

| 1. COMPONENT<br>ARMY   | <b>FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA</b> | 2. DATE<br>05 November 93    |             |                                       |      |     |       |     |      |     |      |     |
|--|---|------------------------------|-------------|---------------------------------------|------|-----|-------|-----|------|-----|------|-----|
| 3. INSTALLATION AND LOCATION<br>Fort Knox, Kentucky  |   |                              |             |                                       |      |     |       |     |      |     |      |     |
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| <p>B. Operations and Maintenance (O&amp;M) impact:</p> <table style="margin-left: auto; margin-right: auto; border: none;"> <thead> <tr> <th style="text-align: left;"><u>YEAR</u></th> <th style="text-align: center;"><u>O&amp;M<br/>NET CHANGE (\$000)</u></th> </tr> </thead> <tbody> <tr> <td>1994</td> <td style="text-align: center;">0.0</td> </tr> <tr> <td>(BOD)</td> <td style="text-align: center;">0.0</td> </tr> <tr> <td>1995</td> <td style="text-align: center;">0.0</td> </tr> <tr> <td>1996</td> <td style="text-align: center;">0.0</td> </tr> </tbody> </table> <p>C. Backlog of Maintenance and Repair (BMAR) impact:</p> <p>There will be no net change in the number of fixtures or in fixture life expectancy. There will be no effect on BMAR.</p> <p>D18. COMMERCIAL ACTIVITIES:</p> <p>The proposed project is not a "New Start Expansion" as defined by DA Circular 235-1. The project has been reviewed in light of the requirements of commercial and industrial facilities. It has been determined that whereas the project does not affect commercial facilities, the requirements of DA Circular 235-1 does not apply.</p> |   |                              | <u>YEAR</u> | <u>O&amp;M<br/>NET CHANGE (\$000)</u> | 1994 | 0.0 | (BOD) | 0.0 | 1995 | 0.0 | 1996 | 0.0 |
| <u>YEAR</u>  | <u>O&amp;M<br/>NET CHANGE (\$000)</u>                     |                              |             |                                       |      |     |       |     |      |     |      |     |
| 1994   | 0.0   |                              |             |                                       |      |     |       |     |      |     |      |     |
| (BOD)  | 0.0   |                              |             |                                       |      |     |       |     |      |     |      |     |
| 1995   | 0.0   |                              |             |                                       |      |     |       |     |      |     |      |     |
| 1996   | 0.0   |                              |             |                                       |      |     |       |     |      |     |      |     |

| 1. COMPONENT<br><b>ARMY</b>  | <b>FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA</b> | 2. DATE<br><b>05 November 93</b>    |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
|--|---|-------------------------------------|-------------------------|---|--------------------------|----------|----------------|----------|-----------------------|-----|------------------|-----|---------------------|-----------|------|--------------------|-----------------------|-------------------------|-----------------------|--------------------------|----------|------|------|----------|-------|-------------|---------|--|--|--|--|--|----------|--|--|--|--|--|-------|--|--|--|--|--|---------|--|--|--|--|--|----------|--|------|----------|--|-------------|---------------------|---------|--------------------|-------|-----------------------|----------|--------------------------|--|------|--------------------------|--------------------------|--------------------|---|-------------------------|-----|-----|-----|-----|----------------------|-----|-----|-----|-----|----|--|-----|-----|-----|----------|-----|-----|-----|-----|
| 3. INSTALLATION AND LOCATION<br><b>Fort Knox, Kentucky</b>   |   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| 4. PROJECT TITLE<br><b>INTERIOR/BALLFIELD LIGHTING REPLACEMENT<br/>AND LIGHTING CONTROL INSTALLATION</b>   |   | 5. PROJECT NUMBER<br><b>ECIP #1</b> |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| <p><b>SPECIAL REQUIREMENTS PARAGRAPH 1 (SRP-1):</b></p> <p>Life Cycle Cost Analysis<br/> Project Title: Interior/Exterior Lighting Replacements<br/> Fiscal Year: 1994<br/> Analysis Date 11/05/93<br/> Economic Life: Fifteen (15) Years</p> <p><b>1. INVESTMENT</b></p> <table style="width: 100%;"> <tr> <td style="width: 60%;">A. CONSTRUCTION COST</td> <td style="text-align: right;">\$373,580</td> </tr> <tr> <td>B. SIOH</td> <td style="text-align: right;">\$18,681</td> </tr> <tr> <td>C. DESIGN COST</td> <td style="text-align: right;">\$18,681</td> </tr> <tr> <td>D. ENERGY CREDIT CALC</td> <td style="text-align: right;">-0-</td> </tr> <tr> <td>E. SALVAGE VALUE</td> <td style="text-align: right;">-0-</td> </tr> <tr> <td>F. TOTAL INVESTMENT</td> <td style="text-align: right;">\$410,942</td> </tr> </table> <p><b>2. ENERGY SAVINGS</b><br/> ANALYSIS DATE ANNUAL SAVINGS, UNIT COST &amp; DISCOUNTED SAVINGS</p> <table style="width: 100%;"> <thead> <tr> <th style="text-align: left;">FUEL</th> <th style="text-align: center;">COST<br/>\$Mbtu (1)</th> <th style="text-align: center;">SAVINGS<br/>MBtu/YR(2)</th> <th style="text-align: center;">ANNUAL \$<br/>SAVINGS(3)</th> <th style="text-align: center;">DISCOUNT<br/>FACTOR(4)</th> <th style="text-align: center;">DISCOUNTED<br/>SAVINGS(5)</th> </tr> </thead> <tbody> <tr> <td>A. ELECT</td> <td style="text-align: center;">7.34</td> <td style="text-align: center;">5436</td> <td style="text-align: right;">\$89,404</td> <td style="text-align: center;">11.77</td> <td style="text-align: right;">\$1,020,077</td> </tr> <tr> <td>B. DIST</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>C. RESID</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>D. NG</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>E. COAL</td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>F. TOTAL</td> <td></td> <td style="text-align: center;">5436</td> <td style="text-align: right;">\$89,401</td> <td></td> <td style="text-align: right;">\$1,020,077</td> </tr> </tbody> </table> <p><b>3. NON-ENERGY SAVINGS</b></p> <table style="width: 100%;"> <tr> <td style="width: 60%;">A. ANNUAL RECURRING</td> <td style="text-align: right;">\$4,555</td> </tr> <tr> <td>    (1)DISCOUNT FACTOR</td> <td style="text-align: center;">11.12</td> </tr> <tr> <td>    (2)DISCOUNTED SAVINGS</td> <td style="text-align: right;">\$50,692</td> </tr> <tr> <td>B. NON-RECURRING SAVINGS</td> <td></td> </tr> </table> <table style="width: 100%;"> <thead> <tr> <th style="text-align: left;">ITEM</th> <th style="text-align: center;">SAVINGS(+)<br/>COST(-)(1)</th> <th style="text-align: center;">YEAR OF<br/>OCCURRENCE(2)</th> <th style="text-align: center;">DISCOUNT<br/>FACTOR</th> <th style="text-align: center;">DISCOUNTED<br/>SAVINGS(+)<br/>COST (-)(4)</th> </tr> </thead> <tbody> <tr> <td>a. Lighting Replacement</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> </tr> <tr> <td>b. Lighting Controls</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> </tr> <tr> <td>c.</td> <td></td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> </tr> <tr> <td>d. Total</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> <td style="text-align: center;">-0-</td> </tr> </tbody> </table> <p>C. TOTAL NON ENERGY DISCOUNTED SAVINGS (+)/COST(-) <span style="float: right;">\$50,652</span></p> |   |                                     | A. CONSTRUCTION COST    | \$373,580                               | B. SIOH                  | \$18,681 | C. DESIGN COST | \$18,681 | D. ENERGY CREDIT CALC | -0- | E. SALVAGE VALUE | -0- | F. TOTAL INVESTMENT | \$410,942 | FUEL | COST<br>\$Mbtu (1) | SAVINGS<br>MBtu/YR(2) | ANNUAL \$<br>SAVINGS(3) | DISCOUNT<br>FACTOR(4) | DISCOUNTED<br>SAVINGS(5) | A. ELECT | 7.34 | 5436 | \$89,404 | 11.77 | \$1,020,077 | B. DIST |  |  |  |  |  | C. RESID |  |  |  |  |  | D. NG |  |  |  |  |  | E. COAL |  |  |  |  |  | F. TOTAL |  | 5436 | \$89,401 |  | \$1,020,077 | A. ANNUAL RECURRING | \$4,555 | (1)DISCOUNT FACTOR | 11.12 | (2)DISCOUNTED SAVINGS | \$50,692 | B. NON-RECURRING SAVINGS |  | ITEM | SAVINGS(+)<br>COST(-)(1) | YEAR OF<br>OCCURRENCE(2) | DISCOUNT<br>FACTOR | DISCOUNTED<br>SAVINGS(+)<br>COST (-)(4) | a. Lighting Replacement | -0- | -0- | -0- | -0- | b. Lighting Controls | -0- | -0- | -0- | -0- | c. |  | -0- | -0- | -0- | d. Total | -0- | -0- | -0- | -0- |
| A. CONSTRUCTION COST   | \$373,580   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| B. SIOH  | \$18,681  |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| C. DESIGN COST   | \$18,681  |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| D. ENERGY CREDIT CALC  | -0-   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| E. SALVAGE VALUE   | -0-   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| F. TOTAL INVESTMENT  | \$410,942   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| FUEL   | COST<br>\$Mbtu (1)  | SAVINGS<br>MBtu/YR(2)               | ANNUAL \$<br>SAVINGS(3) | DISCOUNT<br>FACTOR(4)                   | DISCOUNTED<br>SAVINGS(5) |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| A. ELECT   | 7.34  | 5436                                | \$89,404                | 11.77                                   | \$1,020,077              |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| B. DIST  |   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| C. RESID   |   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| D. NG  |   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| E. COAL  |   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| F. TOTAL   |   | 5436                                | \$89,401                |   | \$1,020,077              |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| A. ANNUAL RECURRING  | \$4,555   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| (1)DISCOUNT FACTOR   | 11.12   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| (2)DISCOUNTED SAVINGS  | \$50,692  |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| B. NON-RECURRING SAVINGS   |   |                                     |                         |   |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| ITEM   | SAVINGS(+)<br>COST(-)(1)                                  | YEAR OF<br>OCCURRENCE(2)            | DISCOUNT<br>FACTOR      | DISCOUNTED<br>SAVINGS(+)<br>COST (-)(4) |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| a. Lighting Replacement  | -0-   | -0-                                 | -0-                     | -0-                                     |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| b. Lighting Controls   | -0-   | -0-                                 | -0-                     | -0-                                     |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| c.   |   | -0-                                 | -0-                     | -0-                                     |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |
| d. Total   | -0-   | -0-                                 | -0-                     | -0-                                     |                          |          |                |          |                       |     |                  |     |                     |           |      |                    |                       |                         |                       |                          |          |      |      |          |       |             |         |  |  |  |  |  |          |  |  |  |  |  |       |  |  |  |  |  |         |  |  |  |  |  |          |  |      |          |  |             |                     |         |                    |       |                       |          |                          |  |      |                          |                          |                    |   |                         |     |     |     |     |                      |     |     |     |     |    |  |     |     |     |          |     |     |     |     |

|  |  |                              |                           |
|--|--|------------------------------|---------------------------|
| 1. COMPONENT<br>ARMY   | FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA |                              | 2. DATE<br>05 November 93 |
| 3. INSTALLATION AND LOCATION<br>Fort Knox, Kentucky  |  |                              |                           |
| 4. PROJECT TITLE<br>INTERIOR/BALLFIELD LIGHTING REPLACEMENT<br>AND LIGHTING CONTROL INSTALLATION |  | 5. PROJECT NUMBER<br>ECIP #1 |                           |
| SPECIAL REQUIREMENTS PARAGRAPH 1 (SRP-1) (continued)   |  |                              |                           |
| D. PROJECT NON ENERGY QUALIFICATION TEST<br>(1) 25% NON ENERGY CALC                              |  |                              |                           |
| 4. FIRST YEAR DOLLAR SAVINGS   |  | \$93,956                     |                           |
| 5. TOTAL NET DISCOUNTED SAVINGS  |  | \$1,070,729                  |                           |
| 6. DISCOUNTED SAVINGS RATIO  |  | 2.61                         |                           |

|   |  |                              |
|---|--|------------------------------|
| 1. COMPONENT<br>ARMY  | FY 19 <u>94</u> MILITARY CONSTRUCTION PROJECT DATA | 2. DATE<br>05 November 93    |
| 3. INSTALLATION AND LOCATION<br>Fort Knox, Kentucky   |  |                              |
| 4. PROJECT TITLE<br>INTERIOR/BALLFIELD LIGHTING REPLACEMENT<br>AND LIGHTING CONTROL INSTALLATION  |  | 5. PROJECT NUMBER<br>ECIP #1 |
| <p><b>SPECIAL REQUIREMENTS PARAGRAPH 3 (SRP-3):</b></p> <p><b>Energy Requirements Appraisal (ERA)</b></p> <p>1. Project Description: Replace existing lighting systems with more efficient lighting systems without reducing the light levels.</p> <p>2. Estimated Energy Consumption: The building are currently lit by standard efficiency lighting. The existing lighting system consumes 14,041 MBtu/Yr of energy. Replacing the existing lighting with high efficiency lighting will result in 5436 MBtu/Yr of electrical energy savings, a thirty-nine percent (39%) reduction in current energy consumption.</p> <p>3. Energy Sources: No new energy sources are required for the proposed project. The use of solar energy for this project is impractical.</p> <p>4. Energy Use Impacts: The proposed project will substantially reduce the consumption of electricity for lighting. The burden on the existing base distribution system will be lessened.</p> <p>5. Energy Conservation: The proposed project will reduce annual energy consumption by 5436 MBtu/Yr with annual energy cost savings of \$93,956. The project complies with Army Resources Management Plan (ERMP) and Executive Order 12759.</p> <p>6. Energy Alternatives: The proposed project represents the greatest possible reduction in energy consumption thirty-nine (39%), without reducing the current lighting levels. The current levels do not exceed the levels recommended by ASHRAE.</p> <p>7. Energy Effects: The proposed project provides positive environmental effects. It reduces the current energy consumption by thirty-nine (39%), effectively reducing the consumption of non-renewable fuel sources. The degrading of environmental standards would not make more efficient energy sources available.</p> <p>8. Basis of Approval: Total energy requirements and alternative fuel sources have been considered and included in this appraisal or discarded as applicable.</p> |  |                              |



# FORT KNOX LIMITED ENERGY STUDY

## SUMMARY OF ENERGY SAVINGS

| ECO NUMBER    | BUILDING NUMBER | BASELINE ENERGY (MBTU) | ECO ENERGY (MBTU) | ENERGY SAVINGS (MBTU) | 1ST YEAR SAVINGS | INVESTMENT COSTS | SPB (YR) | SIR   |
|---------------|-----------------|------------------------|-------------------|-----------------------|------------------|------------------|----------|-------|
| 2             | T58             | 73.646                 | 27.395            | 46.251                | \$1,068          | \$6,889          | 6.45     | 1.76  |
| 2             | T59             | 109.591                | 29.360            | 80.231                | \$1,880          | \$7,382          | 3.93     | 2.88  |
| 2             | T60             | 103.588                | 31.313            | 72.275                | \$1,309          | \$7,873          | 6.01     | 1.89  |
| 2             | 63              | 322.013                | 97.341            | 224.672               | \$4,194          | \$49,984         | 11.92    | 0.95  |
| 2             | 73              | 86.090                 | 39.131            | 46.959                | \$1,036          | \$9,841          | 9.50     | 1.19  |
| 2             | 86              | 236.466                | 96.399            | 140.067               | \$3,050          | \$7,977          | 2.62     | 4.33  |
| 2             | 92              | 103.892                | 62.181            | 41.711                | \$1,160          | \$15,747         | 13.57    | 0.83  |
| 2             | 482             | 107.677                | 74.037            | 33.640                | \$652            | \$8,622          | 13.23    | 0.86  |
| 2             | 483             | 134.598                | 74.037            | 60.551                | \$1,188          | \$8,622          | 7.26     | 1.57  |
| 2             | 484             | 107.677                | 74.037            | 33.640                | \$652            | \$8,622          | 13.23    | 0.86  |
| 2             | 485             | 127.868                | 74.037            | 53.823                | \$1,048          | \$8,622          | 8.22     | 1.38  |
| 2             | 486             | 131.831                | 88.468            | 43.363                | \$837            | \$10,241         | 12.24    | 0.93  |
| 2             | 487             | 35.891                 | 24.678            | 11.213                | \$240            | \$2,875          | 11.99    | 0.95  |
| 2             | 2770            | 2,786.940              | 1,150.523         | 1636.417              | \$28,871         | \$91,073         | 3.15     | 3.61  |
| 2             | 2778            | 604.306                | 399.381           | 204.925               | \$3,594          | \$31,624         | 8.80     | 1.29  |
| 2             | 5232            | 16.355                 | 11.501            | 4.854                 | \$98             | \$1,674          | 17.13    | 0.66  |
| 3.1           | 86              | 97.369                 | 46.559            | 50.810                | \$936            | \$9,410          | 10.05    | 1.13  |
| 3.1           | 94              | 445.642                | 177.192           | 268.450               | \$4,806          | \$7,192          | 1.50     | 7.61  |
| 3.1           | 158             | 220.964                | 109.014           | 111.950               | \$2,242          | \$4,816          | 2.06     | 5.52  |
| 3.1           | 159             | 820.250                | 739.330           | 80.920                | \$1,187          | \$1,754          | 1.48     | 7.74  |
| 3.1           | 2770            | 1,150.044              | 630.464           | 519.580               | \$9,312          | \$9,410          | 1.01     | 11.27 |
| 3.1           | 2730            | 193.804                | 135.184           | 58.620                | \$1,050          | \$5,295          | 5.04     | 2.26  |
| 3.1           | 2778            | 399.321                | 218.911           | 180.410               | \$3,229          | \$9,410          | 2.91     | 3.91  |
| 3.1           | 2942            | 108.936                | 79.746            | 29.190                | \$608            | \$4,185          | 6.88     | 1.65  |
| 3.1           | 2943            | 108.936                | 79.746            | 29.190                | \$608            | \$4,185          | 6.88     | 1.65  |
| 3.1           | 2944            | 207.968                | 155.418           | 52.550                | \$1,099          | \$7,692          | 7.00     | 1.62  |
| 3.1           | 2963            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2969            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2970            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2971            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2972            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2973            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2974            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2979            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 2980            | 58.140                 | 41.000            | 17.140                | \$356            | \$3,077          | 8.65     | 1.31  |
| 3.1           | 5220            | 1,016.726              | 768.826           | 247.900               | \$3,312          | \$5,903          | 1.78     | 6.44  |
| 3.1           | 5222            | 331.880                | 224.670           | 107.210               | \$2,138          | \$5,474          | 2.56     | 4.44  |
| 3.1           | 5253            | 248.910                | 171.280           | 77.630                | \$1,553          | \$5,044          | 3.25     | 3.50  |
| 3.1           | 5256            | 1,578.608              | 1,330.718         | 247.890               | \$3,312          | \$5,903          | 1.78     | 6.44  |
| 4.1           | 2358            | 127.745                | 33.905            | 93.840                | \$837            | \$7,385          | 8.82     | 1.32  |
| 4.1           | 2388N           | 154.360                | 37.970            | 116.390               | \$1,246          | \$4,055          | 3.25     | 3.55  |
| 4.1           | 2388S           | 149.040                | 34.170            | 114.870               | \$1,228          | \$3,650          | 2.97     | 3.89  |
| 4.2           | 2358            | 33.915                 | 28.831            | 5.084                 | \$37             | \$629            | 16.80    | 0.70  |
| 4.2           | 2388N           | 37.980                 | 32.285            | 5.695                 | \$42             | \$629            | 15.03    | 0.78  |
| 4.2           | 2388S           | 34.181                 | 29.056            | 5.125                 | \$37             | \$629            | 16.80    | 0.70  |
| 4.2           | 4557            | 148.582                | 126.302           | 22.280                | \$164            | \$629            | 3.84     | 3.06  |
| 4.2           | 5913            | 148.121                | 125.909           | 22.212                | \$163            | \$629            | 3.86     | 3.05  |
| 4.2           | 6532            | 106.342                | 90.398            | 15.944                | \$117            | \$629            | 5.39     | 2.18  |
| 4.2           | 6609            | 274.306                | 233.174           | 41.132                | \$302            | \$629            | 2.09     | 5.64  |
| 4.2           | 6647            | 285.736                | 242.888           | 42.848                | \$314            | \$629            | 2.00     | 5.88  |
| <b>TOTALS</b> |                 | 14,041.360             | 8,604.769         | 5,436.572             | \$93,956         | \$410,942        | 4.37     | 2.61  |

# FORT KNOX LIMITED ENERGY STUDY

## SUMMARY OF COST ESTIMATES

| ECO<br>NUMBER | BUILDING<br>NUMBER | MATERIAL<br>COSTS (\$) | LABOR<br>COSTS (\$) | ADDITIONAL<br>COSTS (\$) | TOTAL COST<br>ESTIMATE (\$) |
|---------------|--------------------|------------------------|---------------------|--------------------------|-----------------------------|
| 2             | T58                | \$2,968.00             | \$1,574.00          | \$2,347.00               | \$6,889.00                  |
| 2             | T59                | \$3,180.00             | \$1,686.00          | \$2,516.00               | \$7,382.00                  |
| 2             | T60                | \$3,392.00             | \$1,799.00          | \$2,682.00               | \$7,873.00                  |
| 2             | 63                 | \$28,560.00            | \$4,078.00          | \$17,346.00              | \$49,984.00                 |
| 2             | 73                 | \$4,240.00             | \$2,248.00          | \$3,353.00               | \$9,841.00                  |
| 2             | 86                 | \$4,050.00             | \$1,180.00          | \$2,747.00               | \$7,977.00                  |
| 2             | 92                 | \$8,612.00             | \$1,686.00          | \$5,449.00               | \$15,747.00                 |
| 2             | 482                | \$4,308.00             | \$1,349.00          | \$2,965.00               | \$8,622.00                  |
| 2             | 483                | \$4,308.00             | \$1,349.00          | \$2,965.00               | \$8,622.00                  |
| 2             | 484                | \$4,308.00             | \$1,349.00          | \$2,965.00               | \$8,622.00                  |
| 2             | 485                | \$4,308.00             | \$1,349.00          | \$2,965.00               | \$8,622.00                  |
| 2             | 486                | \$5,090.00             | \$1,630.00          | \$3,521.00               | \$10,241.00                 |
| 2             | 487                | \$1,436.00             | \$450.00            | \$989.00                 | \$2,875.00                  |
| 2             | 2770               | \$47,520.00            | \$12,144.00         | \$31,409.00              | \$91,073.00                 |
| 2             | 2778               | \$16,500.00            | \$4,217.00          | \$10,907.00              | \$31,624.00                 |
| 2             | 5232               | \$818.00               | \$281.00            | \$575.00                 | \$1,674.00                  |
| 3.1           | 86                 | \$4,931.00             | \$1,234.00          | \$3,245.00               | \$9,410.00                  |
| 3.1           | 94                 | \$3,679.00             | \$1,037.00          | \$2,476.00               | \$7,192.00                  |
| 3.1           | 158                | \$2,479.00             | \$542.00            | \$1,595.00               | \$4,616.00                  |
| 3.1           | 159                | \$926.00               | \$222.00            | \$606.00                 | \$1,754.00                  |
| 3.1           | 2770               | \$4,931.00             | \$1,234.00          | \$3,245.00               | \$9,410.00                  |
| 3.1           | 2730               | \$2,905.00             | \$558.00            | \$1,832.00               | \$5,295.00                  |
| 3.1           | 2778               | \$4,931.00             | \$1,234.00          | \$3,245.00               | \$9,410.00                  |
| 3.1           | 2942               | \$2,279.00             | \$460.00            | \$1,446.00               | \$4,185.00                  |
| 3.1           | 2943               | \$2,279.00             | \$460.00            | \$1,446.00               | \$4,185.00                  |
| 3.1           | 2944               | \$4,131.00             | \$903.00            | \$2,658.00               | \$7,692.00                  |
| 3.1           | 2963               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2969               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2970               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2971               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2972               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2973               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2974               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2979               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 2980               | \$1,652.00             | \$361.00            | \$1,064.00               | \$3,077.00                  |
| 3.1           | 5220               | \$3,079.00             | \$790.00            | \$2,034.00               | \$5,903.00                  |
| 3.1           | 5222               | \$2,879.00             | \$707.00            | \$1,888.00               | \$5,474.00                  |
| 3.1           | 5253               | \$2,679.00             | \$625.00            | \$1,740.00               | \$5,044.00                  |
| 3.1           | 5256               | \$3,079.00             | \$790.00            | \$2,034.00               | \$5,903.00                  |
| 4.1           | 2358               | \$2,940.00             | \$1,773.00          | \$2,672.00               | \$7,385.00                  |
| 4.1           | 2388N              | \$1,750.00             | \$844.00            | \$1,461.00               | \$4,055.00                  |
| 4.1           | 2388S              | \$1,575.00             | \$760.00            | \$1,315.00               | \$3,650.00                  |
| 4.2           | 2358               | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| 4.2           | 2388N              | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| 4.2           | 2388S              | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| 4.2           | 4557               | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| 4.2           | 5913               | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| 4.2           | 6532               | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| 4.2           | 6609               | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| 4.2           | 6647               | \$250.00               | \$165.00            | \$214.00                 | \$629.00                    |
| <b>TOTALS</b> |                    | <b>\$211,918.00</b>    | <b>\$57,111.00</b>  | <b>\$141,913.00</b>      | <b>\$410,942.00</b>         |

\* INCLUDED SALES TAX, OVERHEAD, PROFIT, BOND, CONTINGENCIES, SIOH & DESIGN.

LIFE CYCLE COST ANALYSIS SUMMARY

STUDY: TOTAL1

LCCID 1.072

ENERGY CONSERVATION INVESTMENT PROGRAM (ECIP)

INSTALLATION & LOCATION: FT KNOX      REGION NOS. 4 CENSUS: 3

PROJECT NO. & TITLE: TLT1      ECO 2, 3.1, 4.1, 4.2

FISCAL YEAR 1994      DISCRETE PORTION NAME: LIGHTING

ANALYSIS DATE: 10-14-93      ECONOMIC LIFE 15 YEARS PREPARED BY: JULIE HOLLENS

1. INVESTMENT

|  |    |         |    |            |
|--|----|---------|----|------------|
| A. CONSTRUCTION COST                   | \$ | 373580. |    |            |
| B. SIOH                                | \$ | 18681.  |    |            |
| C. DESIGN COST                         | \$ | 18681.  |    |            |
| D. TOTAL COST (1A+1B+1C)               | \$ | 410942. |    |            |
| E. SALVAGE VALUE OF EXISTING EQUIPMENT | \$ |         | 0. |            |
| F. PUBLIC UTILITY COMPANY REBATE       | \$ |         | 0. |            |
| G. TOTAL INVESTMENT (1D - 1E - 1F)     |    |         |    | \$ 410942. |

2. ENERGY SAVINGS (+) / COST (-)

DATE OF NISTIR 85-3273-X USED FOR DISCOUNT FACTORS OCT 1992

| FUEL              | UNIT COST<br>\$/MBTU(1) | SAVINGS<br>MBTU/YR(2) | ANNUAL \$<br>SAVINGS(3) | DISCOUNT<br>FACTOR(4) | DISCOUNTED<br>SAVINGS(5) |
|-------------------|-------------------------|-----------------------|-------------------------|-----------------------|--------------------------|
| A. ELECT          | \$ 7.34                 | 5436.                 | \$ 39900.               | 11.77                 | \$ 469626.               |
| B. DIST           | \$ .00                  | 0.                    | \$ 0.                   | 13.83                 | \$ 0.                    |
| C. RESID          | \$ .00                  | 0.                    | \$ 0.                   | 16.15                 | \$ 0.                    |
| D. NAT G          | \$ .00                  | 0.                    | \$ 0.                   | 15.34                 | \$ 0.                    |
| E. COAL           | \$ .00                  | 0.                    | \$ 0.                   | 12.82                 | \$ 0.                    |
| F. PPG            | \$ .00                  | 0.                    | \$ 0.                   | 11.12                 | \$ 0.                    |
| M. DEMAND SAVINGS |                         |                       | \$ 49501.               | 11.12                 | \$ 550451.               |
| N. TOTAL          |                         | 5436.                 | \$ 89401.               |                       | \$ 1020077.              |

3. NON ENERGY SAVINGS(+) / COST(-)

|                                       |       |           |
|---------------------------------------|-------|-----------|
| A. ANNUAL RECURRING (+/-)             |       | \$ 4555.  |
| (1) DISCOUNT FACTOR (TABLE A)         | 11.12 |           |
| (2) DISCOUNTED SAVING/COST (3A X 3A1) |       | \$ 50652. |

B. NON RECURRING SAVINGS(+) / COSTS(-)

| ITEM     | SAVINGS(+)<br>COST(-)<br>(1) | YR<br>OC<br>(2) | DISCNT<br>FACTR<br>(3) | DISCOUNTED<br>SAVINGS(+)/<br>COST(-) (4) |
|----------|------------------------------|-----------------|------------------------|--|
| d. TOTAL | \$ 0.                        |                 |                        | 0.                                       |

C. TOTAL NON ENERGY DISCOUNTED SAVINGS(+)/COST(-) (3A2+3Bd4) \$ 50652.

4. FIRST YEAR DOLLAR SAVINGS  $2N3+3A+(3B1d/(YRS \text{ ECONOMIC LIFE}))$  \$ 93956.

5. SIMPLE PAYBACK PERIOD (1G/4) 4.37 YEARS

6. TOTAL NET DISCOUNTED SAVINGS (2N5+3C) \$ 1070729.

7. SAVINGS TO INVESTMENT RATIO (SIR)=(5 / 1G)= 2.61  
(IF < 1 PROJECT DOES NOT QUALIFY)

8. ADJUSTED INTERNAL RATE OF RETURN (AIRR): 10.86 %

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: T58  
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:  
HOURS/DAY 9.5  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
8 4 LAMP @ 192 WATTS/FIXT = 1,536 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
36 1 LAMP @ 200 WATTS/FIXT = 7,200 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.00  
AVERAGE FOOTCANDLES 6.00  
TOTAL EXISTING KW 8.7  
TOTAL EXISTING KWH 21,576

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/  
REFLECTORS 37 WATTS/FIXT = 0 WATTS  
56 2 LAMP W/  
58 WATTS/FIXT = 3,248 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.45  
AVERAGE FOOTCANDLES 16.00  
TOTAL REPLACEMENT KW 3.2  
TOTAL REPLACEMENT KWH 8,023

NET ENERGY SAVINGS

46.251 MBTU/YR

NET DOLLAR SAVINGS

\$805.08

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:26:29

TITLE PAGE

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LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING T58

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S   E D I T I O N  
COMPOSER Plus Copyright (C) 1985, 1988  
by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING T58  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:26:29

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY | UOM | CREW | MANHR          | LABOR | EQUIPMENT | MATERIAL | SALESTY | DIRECT \$ |
|---|----------|-----|------|----------------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |          |     |      |                |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |          |     |      |                |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      |          |     |      | 0.93           | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   |          |     |      | 56.00 EA EELEF | 1,574 | 7         | 2,968    | 148     | 4,697     |
| TOTAL DIVISION 16 ELECTRICAL                                    |          |     |      | 52             | 1,574 | 7         | 2,968    | 148     | 4,697     |
| TOTAL FACILITY AA. ELECTRICAL                                   |          |     |      | 52             | 1,574 | 7         | 2,968    | 148     | 4,697     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |          |     |      | 52             | 1,574 | 7         | 2,968    | 148     | 4,697     |
| TOTAL BASE BID  |          |     |      | 52             | 1,574 | 7         | 2,968    | 148     | 4,697     |
| TOTAL ADDITIVE  |          |     |      | 0              | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |          |     |      | 52             | 1,574 | 7         | 2,968    | 148     | 4,697     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

PROJECT NOTES

SUMMARY PAGE 1

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PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   | COST TO PRM | OVERHEAD | HOME OFC     | PROFIT    | BOND        | OTHR        | FCTR      | TOTAL COST | UNIT COST |
|----------------|------------|-------------|----------|--------------|-----------|-------------|-------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA     | 4,697    | 10.0%<br>470 | 0.0%<br>0 | 7.5%<br>388 | 2.5%<br>139 | 0.0%<br>0 | 5,693      | 5693.48   |
| BID ITEM TOTAL |            | 1.00 EA     | 4,697    | 470          | 0         | 388         | 139         | 0         | 5,693      | 5693.48   |
| TOTAL BASE BID |            |             | 4,697    | 470          | 0         | 388         | 139         | 0         | 5,693      |           |
| TOTAL ADDITIVE |            |             | 0        | 0            | 0         | 0           | 0           | 0         | 0          |           |
| TOTAL INCL ADD |            |             | 4,697    | 470          | 0         | 388         | 139         | 0         | 5,693      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID BID ITEM  | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|--|--------------|----------|----------|------------|-----------|
| 1. BUILDING TO THE 5 FOOT LINE                             | 1.00 EA      | 5,694    |          | 5,694      | 5693.50   |
| TOTAL CURRENT CONTRACT COST                                |              | 5,694    | 0        | 5,694      |           |
| Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
| ESCALATED CONTRACT COST                                    |              | 5,694    | 0        | 5,694      |           |
| Government-Furnished Property                              |              | 0        |          | 0          |           |
| SUBTOTAL   |              | 5,694    | 0        | 5,694      |           |
| Contingencies  | 10.0%        | 569      | 0        | 569        |           |
| SUBTOTAL   |              | 6,263    | 0        | 6,263      |           |
| SIOH (S&A)   | 5.0%         | 313      | 0        | 313        |           |
| CURRENT WORKING ESTIMATE                                   |              | 6,576    | 0        | 6,576      |           |
| Estimated Construction Time                                | 365 Days     |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PH | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 52     | 1,574 | 7         | 3,116 |      | 4,697  | 100.0% | 0      | 4,697    |
|    | TOTAL DIRECT  |    |          |     | 52     | 1,574 | 7         | 3,116 |      | 4,697  | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHR% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|-------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 4,697    | 470                        | 10.0% | 0.0   | 388                        | 7.5% | 2.5%  | 0.0%  | 5,693                                | 100.0% | 5693.48   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 470                        | 10.0% |       | 388                        | 7.5% |       |       |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 52       | 1,574 | 7         | 2,968    | 148       | 4,697                   |
| TOTAL DIRECT    | 52       | 1,574 | 7         | 2,968    | 148       | 4,697                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 52       | 1,574 | 7         | 2,968    | 148       | 4,697                   |
| TOTAL DIRECT           | 52       | 1,574 | 7         | 2,968    | 148       | 4,697                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| -----                         |             | *** BOOK VALUE *** |    |      | ADJ FACTOR |      | ADJUSTD | BOOK OP | --      | HRLY | ---  | UPB   | **** | TOTAL | **** |
|-------------------------------|-------------|--------------------|----|------|------------|------|---------|---------|---------|------|------|-------|------|-------|------|
| EQUIP                         | DESCRIPTION | LIFE HRS           | TL | HRLY | OWNRSH     | OWNS | OVTM    | OWNRSH  | EXPENSE | RATE | RATE | HOURS |      |       | COST |
| -----                         |             |                    |    |      |            |      |         |         |         |      |      |       |      |       |      |
| EMI20                         | SMALL TOOLS |                    |    |      |            |      |         |         |         | 1.40 | 1.40 | 5     |      |       | 7    |
| TOTAL PROJECT EQUIPMENT HOURS |             |                    |    |      |            |      |         |         |         |      |      | 5     |      |       | 7    |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T58

TIME 08:26:29

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 52            | 1,574         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 52            | 1,574         |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT58E2

3-45



# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: T59  
BUILDING FUNCTION: SMALL PARTS WAREHOUSE

BUILDING USE:  
HOURS/DAY 9.5  
DAYS/WEEK 5

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
65 1 LAMP @ 200 WATTS/FIXT = 13,000 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.31  
AVERAGE FOOTCANDLES 7.50

TOTAL EXISTING KW 13.0  
TOTAL EXISTING KWH 32,110

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
60 2 LAMP W/ 58 WATTS/FIXT = 3,480 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.43  
AVERAGE FOOTCANDLES 15.00

TOTAL REPLACEMENT KW 9.5  
TOTAL REPLACEMENT KWH 8,596

NET ENERGY SAVINGS

80.231 MBTU/YR

NET DOLLAR SAVINGS

\$1,396.57

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:33:33

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING T59

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S   E D I T I O N  
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by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

3-47

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

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| CONTRACTOR DIRECT SUMMARY.....     | 4            |
| CONTRACTOR INDIRECT SUMMARY.....   | 5            |
| CSI DIVISION SUMMARY.....          | 6            |
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| EQUIPMENT SUMMARY.....             | 8            |
| LABOR SUMMARY.....                 | 9            |

| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY | UOM             | CREW  | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|----------|-----------------|-------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |          |                 |       |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |          |                 |       |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | ***      | UNIT COSTS: *** |       | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 60.00    | EA              | EELEF | 56    | 1,686 | 8         | 3,180    | 159     | 5,033     |
| TOTAL DIVISION 16 ELECTRICAL                                    |          |                 |       | 56    | 1,686 | 8         | 3,180    | 159     | 5,033     |
| TOTAL FACILITY AA. ELECTRICAL                                   |          |                 |       | 56    | 1,686 | 8         | 3,180    | 159     | 5,033     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |          |                 |       | 56    | 1,686 | 8         | 3,180    | 159     | 5,033     |
| TOTAL BASE BID  |          |                 |       | 56    | 1,686 | 8         | 3,180    | 159     | 5,033     |
| TOTAL ADDITIVE  |          |                 |       | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |          |                 |       | 56    | 1,686 | 8         | 3,180    | 159     | 5,033     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING T59

TIME 08:33:33

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   | COST TO PRM | OVERHEAD | HOME OFC     | PROFIT    | BOND        | OTHR FCTR   | TOTAL COST | UNIT COST     |
|----------------|------------|-------------|----------|--------------|-----------|-------------|-------------|------------|---------------|
| AA             | ELECTRICAL | 1.00 EA     | 5,033    | 10.0%<br>503 | 0.0%<br>0 | 7.5%<br>415 | 2.5%<br>149 | 0.0%<br>0  | 6,100 6100.17 |
| BID ITEM TOTAL |            | 1.00 EA     | 5,033    | 503          | 0         | 415         | 149         | 0          | 6,100 6100.17 |
| TOTAL BASE BID |            |             | 5,033    | 503          | 0         | 415         | 149         | 0          | 6,100         |
| TOTAL ADDITIVE |            |             | 0        | 0            | 0         | 0           | 0           | 0          | 0             |
| TOTAL INCL ADD |            |             | 5,033    | 503          | 0         | 415         | 149         | 0          | 6,100         |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING T59

TIME 08:33:33

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|--------------|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00 EA      | 6,100    |          | 6,100      | 6100.20   |
|    | TOTAL CURRENT CONTRACT COST                                |              | 6,100    | 0        | 6,100      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |              | 6,100    | 0        | 6,100      |           |
|    | Government-Furnished Property                              |              | 0        |          | 0          |           |
|    | SUBTOTAL   |              | 6,100    | 0        | 6,100      |           |
|    | Contingencies  | 10.0%        | 610      | 0        | 610        |           |
|    | SUBTOTAL   |              | 6,710    | 0        | 6,710      |           |
|    | SIOH (S&A)   | 5.0%         | 336      | 0        | 336        |           |
|    | CURRENT WORKING ESTIMATE                                   |              | 7,046    | 0        | 7,046      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 56     | 1,686 | 8         | 3,339 |      | 5,033  | 100.0% | 0      | 5,033    |
|    | TOTAL DIRECT  |    |          |     | 56     | 1,686 | 8         | 3,339 |      | 5,033  | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD *** | AMOUNT | PCT | HOFC% | **** PROFIT **** | AMOUNT | PCT  | BOND% | OTHER% | ***** TOTAL CONTRACT ***** | AMOUNT | PCT | UNIT COST |
|----|-------------------------|----|----------|------------------|--------|-----|-------|------------------|--------|------|-------|--------|----------------------------|--------|-----|-----------|
| AA | GENERAL/PRIME           |    | 5,033    | 503              | 10.0%  | 0.0 |       | 415              | 7.5%   | 2.5% | 0.0%  |        | 6,100                      | 100.0% |     | 6100.16   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 503              | 10.0%  |     |       | 415              | 7.5%   |      |       |        |                            |        |     |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 56       | 1,686 | 8         | 3,180    | 159       | 5,033                   |
| TOTAL DIRECT    | 56       | 1,686 | 8         | 3,180    | 159       | 5,033                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 56       | 1,686 | 8         | 3,180    | 159       | 5,033                   |
| TOTAL DIRECT           | 56       | 1,686 | 8         | 3,180    | 159       | 5,033                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

3-56

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR |     | ADJUSTD |      | BOOK OP |      | --   | HRLY   | ---     | UPB  | **** | TOTAL | ****  |
|-------------------------------|-------------|------------|-----|---------|------|---------|------|------|--------|---------|------|------|-------|-------|
| EQUIP                         | DESCRIPTION | LIFE       | HRS | TL      | HRLY | OWNRSH  | OWNS | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST  |
| EMI20                         | SMALL TOOLS |            |     |         |      |         |      |      |        |         | 1.40 | 1.40 | 5     | 8     |
|                               |             |            |     |         |      |         |      |      |        |         |      |      | ----- | ----- |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |     |         |      |         |      |      |        |         |      |      | 5     | 8     |

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T59

TIME 08:33:33

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 56            | 1,686         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 56            | 1,686         |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT59E2

3-58

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: T60  
BUILDING FUNCTION: WAREHOUSE

### BUILDING USE:

HOURS/DAY 9.5  
DAYS/WEEK 5

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
64 4 LAMP @ 192 WATTS/FIXT = 12,288 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES

1.23  
20.00

TOTAL EXISTING KW  
TOTAL EXISTING KWH

12.3  
30,351

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/  
REFLECTORS 37 WATTS/FIXT = 0 WATTS  
64 2 LAMP W/  
58 WATTS/FIXT = 3,712 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES

0.46  
20.00

TOTAL REPLACEMENT KW  
TOTAL REPLACEMENT KWH

3.7  
9,169

NET ENERGY SAVINGS

72.275 MBTU/YR

NET DOLLAR SAVINGS

\$1,258.08

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:41:10

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING T60

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

3-60

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

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| EQUIPMENT SUMMARY.....             | 8            |
| LABOR SUMMARY.....                 | 9            |

| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

\* \* \* END TABLE OF CONTENTS \* \* \*



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY | UOM             | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|----------|-----------------|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |          |                 |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |          |                 |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | ***      | UNIT COSTS: *** |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 64.00    | EA EELEF        |      | 60    | 1,799 | 8         | 3,392    | 170     | 5,368     |
| TOTAL DIVISION 16 ELECTRICAL                                    |          |                 |      | 60    | 1,799 | 8         | 3,392    | 170     | 5,368     |
| TOTAL FACILITY AA. ELECTRICAL                                   |          |                 |      | 60    | 1,799 | 8         | 3,392    | 170     | 5,368     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |          |                 |      | 60    | 1,799 | 8         | 3,392    | 170     | 5,368     |
| TOTAL BASE BID  |          |                 |      | 60    | 1,799 | 8         | 3,392    | 170     | 5,368     |
| TOTAL ADDITIVE  |          |                 |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |          |                 |      | 60    | 1,799 | 8         | 3,392    | 170     | 5,368     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

3-62

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD | HOME OFC | PROFIT | BOND | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|----------|----------|--------|------|-----------|------------|-----------|
| AA             | ELECTRICAL |         |             | 10.0%    | 0.0%     | 7.5%   | 2.5% | 0.0%      |            |           |
|                |            | 1.00 EA | 5,368       | 537      | 0        | 443    | 159  | 0         | 6,507      | 6506.84   |
| BID ITEM TOTAL |            | 1.00 EA | 5,368       | 537      | 0        | 443    | 159  | 0         | 6,507      | 6506.84   |
| TOTAL BASE BID |            |         | 5,368       | 537      | 0        | 443    | 159  | 0         | 6,507      |           |
| TOTAL ADDITIVE |            |         | 0           | 0        | 0        | 0      | 0    | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 5,368       | 537      | 0        | 443    | 159  | 0         | 6,507      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|--------------|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00 EA      | 6,507    |          | 6,507      | 6506.80   |
|    | TOTAL CURRENT CONTRACT COST                                |              | 6,507    | 0        | 6,507      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |              | 6,507    | 0        | 6,507      |           |
|    | Government-Furnished Property                              |              | 0        |          | 0          |           |
|    | SUBTOTAL   |              | 6,507    | 0        | 6,507      |           |
|    | Contingencies  | 10.0%        | 651      | 0        | 651        |           |
|    | SUBTOTAL   |              | 7,157    | 0        | 7,157      |           |
|    | SIOH (S&A)   | 5.0%         | 358      | 0        | 358        |           |
|    | CURRENT WORKING ESTIMATE                                   |              | 7,515    | 0        | 7,515      |           |
|    | Estimated Construction Time                                | 365 Days     |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

3-65

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | ** TOTAL DIRECT * | * SUBCON * | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|-------------------|------------|--------|----------|
|    |               |    |          |     |        |       |           |       |      | AMOUNT            | PCT        |        |          |
| AA | GENERAL/PRIME |    | 1.00     | EA  | 60     | 1,799 | 8         | 3,562 |      | 5,368             | 100.0%     | 0      | 5,368    |
|    | TOTAL DIRECT  |    |          |     | 60     | 1,799 | 8         | 3,562 |      | 5,368             | 100.0%     |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD *** | AMOUNT | PCT | HOFC% | **** PROFIT **** | AMOUNT | PCT  | BOND% | OTHER% | ***** TOTAL CONTRACT ***** | AMOUNT | PCT | UNIT COST |
|----|-------------------------|----|----------|------------------|--------|-----|-------|------------------|--------|------|-------|--------|----------------------------|--------|-----|-----------|
| AA | GENERAL/PRIME           |    | 5,368    | 537              | 10.0%  | 0.0 |       | 443              | 7.5%   | 2.5% | 0.0%  |        | 6,507                      | 100.0% |     | 6506.84   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 537              | 10.0%  |     |       | 443              | 7.5%   |      |       |        |                            |        |     |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

3-67

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 60       | 1,799 | 8         | 3,392    | 170       | 5,368                   |
| TOTAL DIRECT    | 60       | 1,799 | 8         | 3,392    | 170       | 5,368                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2

3-68

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 60       | 1,799 | 8         | 3,392    | 170       | 5,368                   |
| TOTAL DIRECT           | 60       | 1,799 | 8         | 3,392    | 170       | 5,368                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR |    | ADJUSTD |        | BOOK OP -- |      | HRLY   | ---     | UPB  | **** | TOTAL | ****  |
|-------------------------------|-------------|------------|----|---------|--------|------------|------|--------|---------|------|------|-------|-------|
| EQUIP                         | DESCRIPTION | LIFE HRS   | TL | HRLY    | OWNRSH | OWNS       | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST  |
| EMI20                         | SMALL TOOLS |            |    |         |        |            |      |        |         | 1.40 | 1.40 | 6     | 8     |
|                               |             |            |    |         |        |            |      |        |         |      |      | ----- | ----- |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |    |         |        |            |      |        |         |      |      | 6     | 8     |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: OT60E2  
3-70

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING T60

TIME 08:41:10

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTH | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 60            | 1,799         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 60            | 1,799         |

\* \* \* END OF SUMMARY REPORT \* \* \*

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 63  
BUILDING FUNCTION: ADMINISTRATIVE

BUILDING USE:  
HOURS/DAY 9  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
210 4 LAMP @ 192 WATTS/FIXT = 40,320 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES

1.72  
50.00

TOTAL EXISTING KW  
TOTAL EXISTING KWH

40.3  
94,349

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS  
210 2 LAMP W/ REFLECTORS 58 WATTS/FIXT = 12,180 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES

0.64  
50.00

TOTAL REPLACEMENT KW  
TOTAL REPLACEMENT KWH

12.2  
28,501

NET ENERGY SAVINGS

224,672 MBTU/YR

NET DOLLAR SAVINGS

\$4,036.41

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 07:50:41

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 63

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N  
COMPOSER Plus Copyright (C) 1985, 1988  
by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

3-73

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

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| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 63  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 07:50:41

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL   | QUANTITY | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|--|----------|-----|------|-------|-------|-----------|----------|---------|-----------|
| <hr/>  |          |     |      |       |       |           |          |         |           |
| 16500 LIGHTING   |          |     |      |       |       |           |          |         |           |
| 16512 7000 FLUORESCENT - RECESSED T8 ELECTRONIC BALLAST          |          |     |      |       |       |           |          |         |           |
| CD=3 EL 7003 4 FT 2 LAMP PARABOLIC LOUVRE W/ *** UNIT COSTS: *** | 0.59     |     |      |       | 19.42 | 0.08      | 136.00   | 6.80    | 162.29    |
| WC=1100 REFLECTOR 210.00 EA EELEB                                | 124      |     |      |       | 4,078 | 16        | 28,560   | 1,428   | 34,082    |
| <hr/>  |          |     |      |       |       |           |          |         |           |
| TOTAL DIVISION 16 ELECTRICAL                                     | 124      |     |      |       | 4,078 | 16        | 28,560   | 1,428   | 34,082    |
| <hr/>  |          |     |      |       |       |           |          |         |           |
| TOTAL FACILITY AA. ELECTRICAL                                    | 124      |     |      |       | 4,078 | 16        | 28,560   | 1,428   | 34,082    |
| <hr/>  |          |     |      |       |       |           |          |         |           |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                    | 124      |     |      |       | 4,078 | 16        | 28,560   | 1,428   | 34,082    |
| <hr/>  |          |     |      |       |       |           |          |         |           |
| TOTAL BASE BID   | 124      |     |      |       | 4,078 | 16        | 28,560   | 1,428   | 34,082    |
| <hr/>  |          |     |      |       |       |           |          |         |           |
| TOTAL ADDITIVE   | 0        |     |      |       | 0     | 0         | 0        | 0       | 0         |
| <hr/>  |          |     |      |       |       |           |          |         |           |
| TOTAL INCL ADD LIMITED ENERGY STUDY                              | 124      |     |      |       | 4,078 | 16        | 28,560   | 1,428   | 34,082    |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD       | HOME OFC  | PROFIT        | BOND          | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|----------------|-----------|---------------|---------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 34,082      | 10.0%<br>3,408 | 0.0%<br>0 | 7.5%<br>2,812 | 2.5%<br>1,008 | 0.0%<br>0 | 41,309     | 41309.08  |
| BID ITEM TOTAL |            | 1.00 EA | 34,082      | 3,408          | 0         | 2,812         | 1,008         | 0         | 41,309     | 41309.08  |
| TOTAL BASE BID |            |         | 34,082      | 3,408          | 0         | 2,812         | 1,008         | 0         | 41,309     |           |
| TOTAL ADDITIVE |            |         | 0           | 0              | 0         | 0             | 0             | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 34,082      | 3,408          | 0         | 2,812         | 1,008         | 0         | 41,309     |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM  | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|------|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA   | 41,309   |          | 41,309     | 41309.10  |
|    | TOTAL CURRENT CONTRACT COST                                |          |      | 41,309   | 0        | 41,309     |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |      | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |      | 41,309   | 0        | 41,309     |           |
|    | Government-Furnished Property                              |          |      | 0        |          | 0          |           |
|    | SUBTOTAL   |          |      | 41,309   | 0        | 41,309     |           |
|    | Contingencies  | 10.0%    |      | 4,131    | 0        | 4,131      |           |
|    | SUBTOTAL   |          |      | 45,440   | 0        | 45,440     |           |
|    | SIOH (S&A)   | 5.0%     |      | 2,272    | 0        | 2,272      |           |
|    | CURRENT WORKING ESTIMATE                                   |          |      | 47,712   | 0        | 47,712     |           |
|    | Estimated Construction Time                                | 365      | Days |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT    | W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|--------|------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 124    | 4,078 | 16        | 29,988 |      | 34,082 | 100.0% | 0      | 34,082   |
|    | TOTAL DIRECT  |    |          |     | 124    | 4,078 | 16        | 29,988 |      | 34,082 | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID CONTRACTOR           |  | PH | SUBTOTAL | *** OVERHEAD *** |       | **** PROFIT **** |        | ***** TOTAL CONTRACT ***** |              | UNIT COST     |
|-------------------------|--|----|----------|------------------|-------|------------------|--------|----------------------------|--------------|---------------|
|                         |  |    |          | AMOUNT           | PCT   | HOFC%            | AMOUNT | PCT                        | BOND% OTHER% | AMOUNT PCT    |
| AA GENERAL/PRIME        |  |    | 34,082   | 3,408            | 10.0% | 0.0              | 2,812  | 7.5%                       | 2.5% 0.0%    | 41,309 100.0% |
| TOTAL OVERHEAD & PROFIT |  |    |          | 3,408            | 10.0% |                  | 2,812  | 7.5%                       |              | 41309.08      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 124      | 4,078 | 16        | 28,560   | 1,428     | 34,082                  |
| TOTAL DIRECT    | 124      | 4,078 | 16        | 28,560   | 1,428     | 34,082                  |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 124      | 4,078 | 16        | 28,560   | 1,428     | 34,082                  |
| TOTAL DIRECT           | 124      | 4,078 | 16        | 28,560   | 1,428     | 34,082                  |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR |    | ADJUSTD |        | BOOK OP -- |      | HRLY   | ---     | UPB  | **** | TOTAL | **** |
|-------------------------------|-------------|------------|----|---------|--------|------------|------|--------|---------|------|------|-------|------|
| EQUIP                         | DESCRIPTION | LIFE HRS   | TL | HRLY    | OWNRSH | OWNS       | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST |
| EMI20                         | SMALL TOOLS |            |    |         |        |            |      |        |         | 1.40 | 1.40 | 11    | 16   |
|                               |             |            |    |         |        |            |      |        |         |      |      | 11    | 16   |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |    |         |        |            |      |        |         |      |      |       |      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

3-83

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 63

TIME 07:50:41

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 124           | 4,078         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 124           | 4,078         |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0063E2

3-84

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 73  
BUILDING FUNCTION: MACHINE SHOP

BUILDING USE:  
HOURS/DAY 9.5  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
41 4 LAMP @ 192 WATTS/FIXT = 7,872 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
26 1 LAMP @ 90 WATTS/FIXT = 2,340 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.98  
AVERAGE FOOTCANDLES 22.00  
TOTAL EXISTING KW 10.2  
TOTAL EXISTING KWH 25,224

NET ENERGY SAVINGS

46.959 MBTU/YR

\$817.40

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/  
REFLECTORS 37 WATTS/FIXT = 0 WATTS  
80 2 LAMP W/ 58 WATTS/FIXT = 4,640 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.54  
AVERAGE FOOTCANDLES 30.00  
TOTAL REPLACEMENT KW 4.6  
TOTAL REPLACEMENT KWH 11,461

NET DOLLAR SAVINGS

\$817.40



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:01:43

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 73

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-86

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

TIME 08:01:43

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73  
1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 08:01:43

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY | UOM             | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|----------|-----------------|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |          |                 |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |          |                 |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | ***      | UNIT COSTS: *** |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 80.00    | EA EELEF        |      | 75    | 2,248 | 10        | 4,240    | 212     | 6,711     |
| -----   |          |                 |      |       |       |           |          |         |           |
| TOTAL DIVISION 16 ELECTRICAL                                    |          |                 |      | 75    | 2,248 | 10        | 4,240    | 212     | 6,711     |
| -----   |          |                 |      |       |       |           |          |         |           |
| TOTAL FACILITY AA. ELECTRICAL                                   |          |                 |      | 75    | 2,248 | 10        | 4,240    | 212     | 6,711     |
| -----   |          |                 |      |       |       |           |          |         |           |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |          |                 |      | 75    | 2,248 | 10        | 4,240    | 212     | 6,711     |
| -----   |          |                 |      |       |       |           |          |         |           |
| TOTAL BASE BID  |          |                 |      | 75    | 2,248 | 10        | 4,240    | 212     | 6,711     |
| -----   |          |                 |      |       |       |           |          |         |           |
| TOTAL ADDITIVE  |          |                 |      | 0     | 0     | 0         | 0        | 0       | 0         |
| -----   |          |                 |      |       |       |           |          |         |           |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |          |                 |      | 75    | 2,248 | 10        | 4,240    | 212     | 6,711     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

TIME 08:01:43

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-89

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

TIME 08:01:43

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT      | BOND        | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|-------------|-----------|------------|-----------|
| AA             | ELECTRICAL |         |             |              |           |             |             |           |            |           |
|                |            | 1.00 EA | 6,711       | 10.0%<br>671 | 0.0%<br>0 | 7.5%<br>554 | 2.5%<br>198 | 0.0%<br>0 | 8,134      | 8133.55   |
| BID ITEM TOTAL |            | 1.00 EA | 6,711       | 671          | 0         | 554         | 198         | 0         | 8,134      | 8133.55   |
| TOTAL BASE BID |            |         | 6,711       | 671          | 0         | 554         | 198         | 0         | 8,134      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0           | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 6,711       | 671          | 0         | 554         | 198         | 0         | 8,134      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

TIME 08:01:43

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA  | 8,134    |          | 8,134      | 8133.50   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 8,134    | 0        | 8,134      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 8,134    | 0        | 8,134      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 8,134    | 0        | 8,134      |           |
|    | Contingencies  | 10.0%    |     | 813      | 0        | 813        |           |
|    | SUBTOTAL   |          |     | 8,947    | 0        | 8,947      |           |
|    | SIOH (S&A)   | 5.0%     |     | 447      | 0        | 447        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 9,394    | 0        | 9,394      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

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CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | ** TOTAL DIRECT *<br>AMOUNT PCT | ** SUBCON *<br>W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|---------------------------------|-----------------------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 75     | 2,248 | 10        | 4,452    | 6,711 100.0%                    | 0                     | 6,711    |
|    | TOTAL DIRECT  |    |          |     | 75     | 2,248 | 10        | 4,452    | 6,711 100.0%                    |                       |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

TIME 08:01:43

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID CONTRACTOR |               | PH | SUBTOTAL | *** OVERHEAD *** |       |       | **** PROFIT **** |      |       | ***** TOTAL CONTRACT ***** |        |        |           |
|---------------|---------------|----|----------|------------------|-------|-------|------------------|------|-------|----------------------------|--------|--------|-----------|
|               |               |    |          | AMOUNT           | PCT   | HOFC% | AMOUNT           | PCT  | BOND% | OTHR%                      | AMOUNT | PCT    | UNIT COST |
| AA            | GENERAL/PRIME |    | 6,711    | 671              | 10.0% | 0.0   | 554              | 7.5% | 2.5%  | 0.0%                       | 8,134  | 100.0% | 8133.55   |
|               |               |    |          | -----            |       |       | -----            |      |       |                            |        |        |           |
|               |               |    |          | 671              | 10.0% |       | 554              | 7.5% |       |                            |        |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

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CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 75       | 2,248 | 10        | 4,240    | 212       | 6,711                   |
| TOTAL DIRECT    | 75       | 2,248 | 10        | 4,240    | 212       | 6,711                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

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SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 75       | 2,248 | 10        | 4,240    | 212       | 6,711                   |
| TOTAL DIRECT           | 75       | 2,248 | 10        | 4,240    | 212       | 6,711                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-95

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

TIME 08:01:43

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR | ADJUSTD | BOOK OP | --     | HRLY | ---  | UPB    | ****    | TOTAL | **** |       |      |
|-------------------------------|-------------|------------|---------|---------|--------|------|------|--------|---------|-------|------|-------|------|
| EQUIP                         | DESCRIPTION | LIFE HRS   | TL      | HRLY    | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | RATE  | RATE | HOURS | COST |
| EMI20                         | SMALL TOOLS |            |         |         |        |      |      |        |         | 1.40  | 1.40 | 7     | 10   |
|                               |             |            |         |         |        |      |      |        |         |       |      | 7     | 10   |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |         |         |        |      |      |        |         |       |      |       |      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-96

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 73

TIME 08:01:43

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 75            | 2,248         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 75            | 2,248         |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0073E2

3-97

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 86  
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:  
HOURS/DAY 9.5  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
13 1 LAMP @ 750 WATTS/FIXT = 9,750 WATTS  
61 1 LAMP @ 300 WATTS/FIXT = 18,300 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES

1.29  
28.1  
TOTAL EXISTING KW  
TOTAL EXISTING KWH

NET ENERGY SAVINGS

140.067 MBTU/YR

NET DOLLAR SAVINGS

\$2,438.12

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/  
REFLECTORS 37 WATTS/FIXT = 0 WATTS  
0 2 LAMP W/  
REFLECTORS 58 WATTS/FIXT = 0 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
36 FIXTURES @ 240 WATTS/FIXT = 8,640 WATTS  
6 FIXTURES @ 465 WATTS/FIXT = 2,790 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES

0.53  
21.00  
TOTAL REPLACEMENT KW  
TOTAL REPLACEMENT KWH

NET DOLLAR SAVINGS

\$2,438.12

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:10:13

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 86

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-99

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

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DETAILED ESTIMATE

DETAIL PAGE

|                                |   |
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| 1. BUILDING TO THE 5 FOOT LINE |   |
| AA. ELECTRICAL.....            | 1 |

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 86

TIME 08:10:13

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL                        | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING                                |                     |     |      |       |       |           |          |         |           |
| 16512 9000 HIGH INTENSITY DISCHARGE           |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP       | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 95.00    | 4.75    | 127.98    |
| WC=1100                                       | 36.00 EA EELEF      |     |      | 34    | 1,012 | 5         | 3,420    | 171     | 4,607     |
| CD=3 EL 9004 400 W HPS FIXTURE AND LAMP       | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 105.00   | 5.25    | 138.48    |
| WC=1100                                       | 6.00 EA EELEF       |     |      | 6     | 169   | 1         | 630      | 32      | 831       |
| TOTAL DIVISION 16 ELECTRICAL                  |                     |     |      | 39    | 1,180 | 5         | 4,050    | 203     | 5,438     |
| TOTAL FACILITY AA. ELECTRICAL                 |                     |     |      | 39    | 1,180 | 5         | 4,050    | 203     | 5,438     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE |                     |     |      | 39    | 1,180 | 5         | 4,050    | 203     | 5,438     |
| TOTAL BASE BID                                |                     |     |      | 39    | 1,180 | 5         | 4,050    | 203     | 5,438     |
| TOTAL ADDITIVE                                |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY           |                     |     |      | 39    | 1,180 | 5         | 4,050    | 203     | 5,438     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-101



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-102

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD | HOME OFC | PROFIT | BOND | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|----------|----------|--------|------|-----------|------------|-----------|
| AA             | ELECTRICAL |         |             | 10.0%    | 0.0%     | 7.5%   | 2.5% | 0.0%      |            |           |
|                |            | 1.00 EA | 5,438       | 544      | 0        | 449    | 161  | 0         | 6,591      | 6591.46   |
| BID ITEM TOTAL |            | 1.00 EA | 5,438       | 544      | 0        | 449    | 161  | 0         | 6,591      | 6591.46   |
| TOTAL BASE BID |            |         | 5,438       | 544      | 0        | 449    | 161  | 0         | 6,591      |           |
| TOTAL ADDITIVE |            |         | 0           | 0        | 0        | 0      | 0    | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 5,438       | 544      | 0        | 449    | 161  | 0         | 6,591      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00     | EA  | 6,592    |          | 6,592      | 6591.50   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 6,592    | 0        | 6,592      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 6,592    | 0        | 6,592      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 6,592    | 0        | 6,592      |           |
|    | Contingencies  | 10.0%    |     | 659      | 0        | 659        |           |
|    | SUBTOTAL   |          |     | 7,251    | 0        | 7,251      |           |
|    | SIOH (S&A)   | 5.0%     |     | 363      | 0        | 363        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 7,613    | 0        | 7,613      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 39     | 1,180 | 5         | 4,253    | 5,438  | 100.0% | 0      | 5,438    |
|    | TOTAL DIRECT  |    |          |     | 39     | 1,180 | 5         | 4,253    | 5,438  | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-105

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT PCT | HOFC% | **** PROFIT ****<br>AMOUNT PCT | BOND% | OTHER% | ***** TOTAL CONTRACT *****<br>AMOUNT PCT | UNIT COST |
|----|-------------------------|----|----------|--------------------------------|-------|--------------------------------|-------|--------|--|-----------|
| AA | GENERAL/PRIME           |    | 5,438    | 544 10.0%                      | 0.0   | 449 7.5%                       | 2.5%  | 0.0%   | 6,591 100.0%                             | 6591.45   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 544 10.0%                      |       | 449 7.5%                       |       |        |  |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 39       | 1,180 | 5         | 4,050    | 203       | 5,438                   |
| TOTAL DIRECT    | 39       | 1,180 | 5         | 4,050    | 203       | 5,438                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-107

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 39       | 1,180 | 5         | 4,050    | 203       | 5,438                   |
| TOTAL DIRECT           | 39       | 1,180 | 5         | 4,050    | 203       | 5,438                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-108

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP DESCRIPTION             | LIFE HRS | TL | HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | HRLY RATE | UPB RATE | **** TOTAL HOURS | **** COST |
|-------------------------------|----------|----|------|--------|------|------|--------|---------|-----------|----------|------------------|-----------|
| EMI20 SMALL TOOLS             |          |    |      |        |      |      |        |         | 1.40      | 1.40     | 4                | 5         |
|                               |          |    |      |        |      |      |        |         |           |          | 4                | 5         |
| TOTAL PROJECT EQUIPMENT HOURS |          |    |      |        |      |      |        |         |           |          |                  |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-109



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 86

TIME 08:10:13

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 39            | 1,180         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 39            | 1,180         |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0086E2

3-110

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 92  
BUILDING FUNCTION: WAREHOUSE

BUILDING USE:  
HOURS/DAY 10.5  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
50 2 LAMP @ 96 WATTS/FIXT = 4,800 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
7 1 LAMP @ 150 WATTS/FIXT = 1,050 WATTS  
53 1 LAMP @ 100 WATTS/FIXT = 5,300 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.03  
AVERAGE FOOTCANDLES 10.00

TOTAL EXISTING KW 11.2  
TOTAL EXISTING KWH 30,440

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
4 2 LAMP W/ 58 WATTS/FIXT = 232 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
56 FIXTURES @ 115 WATTS/FIXT = 6,440 WATTS  
0 FIXTURES @ 300 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.60  
AVERAGE FOOTCANDLES 18.00

TOTAL REPLACEMENT KW 6.7  
TOTAL REPLACEMENT KWH 18,215

NET ENERGY SAVINGS

41.711 MBTU/YR

NET DOLLAR SAVINGS

\$686.09

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 08:18:25

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 92

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S   E D I T I O N  
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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-112

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

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Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 92

TIME 08:18:25

DETAILED ESTIMATE

DETAIL PAGE 1

## 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL                               | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|--|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING                                       |                     |     |      |       |       |           |          |         |           |
| 16512 8000   |                     |     |      |       |       |           |          |         |           |
| FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                           | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100  | 4.00 EA EELEF       |     | 4    |       | 112   | 1         | 212      | 11      | 336       |
| 16512 9000 HIGH INTENSITY DISCHARGE                  |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9002 100 W HPS FIXTURE AND LAMP FOR          | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 150.00   | 7.50    | 185.73    |
| WC=1100 LOW BAY W/ 13' HEIGHT                        | 56.00 EA EELEF      |     | 52   |       | 1,574 | 7         | 8,400    | 420     | 10,401    |
| TOTAL DIVISION 16 ELECTRICAL                         |                     |     |      | 56    | 1,686 | 8         | 8,612    | 431     | 10,736    |
| TOTAL FACILITY AA. ELECTRICAL                        |                     |     |      | 56    | 1,686 | 8         | 8,612    | 431     | 10,736    |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE        |                     |     |      | 56    | 1,686 | 8         | 8,612    | 431     | 10,736    |
| TOTAL BASE BID                                       |                     |     |      | 56    | 1,686 | 8         | 8,612    | 431     | 10,736    |
| TOTAL ADDITIVE                                       |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                  |                     |     |      | 56    | 1,686 | 8         | 8,612    | 431     | 10,736    |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-114

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

PROJECT NOTES

SUMMARY PAGE 1

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PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-115

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD       | HOME OFC  | PROFIT      | BOND        | OTHER FCTR | TOTAL COST | UNIT COST       |
|----------------|------------|---------|-------------|----------------|-----------|-------------|-------------|------------|------------|-----------------|
| AA             | ELECTRICAL | 1.00 EA | 10,736      | 10.0%<br>1,074 | 0.0%<br>0 | 7.5%<br>886 | 2.5%<br>317 | 0.0%<br>0  | 13,013     | 13013.28        |
| BID ITEM TOTAL |            |         | 1.00 EA     | 10,736         | 1,074     | 0           | 886         | 317        | 0          | 13,013 13013.28 |
| TOTAL BASE BID |            |         |             | 10,736         | 1,074     | 0           | 886         | 317        | 0          | 13,013          |
| TOTAL ADDITIVE |            |         |             | 0              | 0         | 0           | 0           | 0          | 0          | 0               |
| TOTAL INCL ADD |            |         |             | 10,736         | 1,074     | 0           | 886         | 317        | 0          | 13,013          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-116

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA  | 13,013   |          | 13,013     | 13013.30  |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 13,013   | 0        | 13,013     |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 13,013   | 0        | 13,013     |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 13,013   | 0        | 13,013     |           |
|    | Contingencies  | 10.0%    |     | 1,301    | 0        | 1,301      |           |
|    | SUBTOTAL   |          |     | 14,315   | 0        | 14,315     |           |
|    | SIOH (S&A)   | 5.0%     |     | 716      | 0        | 716        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 15,030   | 0        | 15,030     |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-117



Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PH | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 56     | 1,686 | 8         | 9,043    | 10,736 | 100.0% | 0      | 10,736   |
|    | TOTAL DIRECT  |    |          |     | 56     | 1,686 | 8         | 9,043    | 10,736 | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-118

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHER% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|--------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 10,736   | 1,074                      | 10.0% | 0.0   | 886                        | 7.5% | 2.5%  | 0.0%   | 13,013                               | 100.0% | 13013.28  |
|    | TOTAL OVERHEAD & PROFIT |    |          | 1,074                      | 10.0% |       | 886                        | 7.5% |       |        |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-119

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 56       | 1,686 | 8         | 8,612    | 431       | 10,736                  |
| TOTAL DIRECT    | 56       | 1,686 | 8         | 8,612    | 431       | 10,736                  |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-120

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 56       | 1,686 | 8         | 8,612    | 431       | 10,736                  |
| TOTAL DIRECT           | 56       | 1,686 | 8         | 8,612    | 431       | 10,736                  |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-121

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP                         | DESCRIPTION | LIFE HRS | TL | HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | HRLY | UPB  | ****  | TOTAL | **** |
|-------------------------------|-------------|----------|----|------|--------|------|------|--------|---------|------|------|-------|-------|------|
|                               |             |          |    |      |        |      |      |        |         | RATE | RATE | HOURS |       | COST |
| EMI20                         | SMALL TOOLS |          |    |      |        |      |      |        |         | 1.40 | 1.40 | 5     |       | 8    |
|                               |             |          |    |      |        |      |      |        |         |      |      |       | 5     | 8    |
| TOTAL PROJECT EQUIPMENT HOURS |             |          |    |      |        |      |      |        |         |      |      |       |       |      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-122

Wed 15 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 92

TIME 08:18:25

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TYS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 56            | 1,686         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 56            | 1,686         |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0092E2

3-123

# FORT KNOX LIMITED ENERGY STUDY

## ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

### FACILITY LIGHTING REPLACEMENT

BUILDING #: 482

BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

BUILDING USE:

HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

#### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
96 2 LAMP @ 158 WATTS/FIXT = 15,168 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.40  
AVERAGE FOOTCANDLES 20.00

TOTAL EXISTING KW 15.2  
TOTAL EXISTING KWH 31,549

NET ENERGY SAVINGS

33,640 MBTU/YR

NET DOLLAR SAVINGS \$649.02

#### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
6 2 LAMP W/ 58 WATTS/FIXT = 348 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.93  
AVERAGE FOOTCANDLES 30.00

TOTAL REPLACEMENT KW 10.4  
TOTAL REPLACEMENT KWH 21,690

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:00:07

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 482

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S   E D I T I O N  
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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0432E2

3-125



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

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DETAILED ESTIMATE

DETAIL PAGE

|                                |   |
|--------------------------------|---|
| 1. BUILDING TO THE 5 FOOT LINE |   |
| AA. ELECTRICAL.....            | 1 |

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Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 482

TIME 15:00:07

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTY | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |                     |     |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP<br>WC=1100                           | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
|   | 6.00 EA EELEF       |     |      | 6     | 169   | 1         | 318      | 16      | 503       |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP<br>WC=1100              | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 95.00    | 4.75    | 127.98    |
|   | 42.00 EA EELEF      |     |      | 39    | 1,180 | 5         | 3,990    | 200     | 5,375     |
| TOTAL DIVISION 16 ELECTRICAL                                    |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL FACILITY AA. ELECTRICAL                                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BASE BID  |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL ADDITIVE  |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-127

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-128

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT      | BOND        | OTHER FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|-------------|------------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 5,879       | 10.0%<br>588 | 0.0%<br>0 | 7.5%<br>485 | 2.5%<br>174 | 0.0%<br>0  | 7,125      | 7125.11   |
| BID ITEM TOTAL |            | 1.00 EA | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      | 7125.11   |
| TOTAL BASE BID |            |         | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0           | 0          | 0          |           |
| TOTAL INCL ADD |            |         | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-129

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 482

TIME 15:00:07

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|--------------|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00 EA      | 7,125    |          | 7,125      | 7125.10   |
|    | TOTAL CURRENT CONTRACT COST                                |              | 7,125    | 0        | 7,125      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |              | 7,125    | 0        | 7,125      |           |
|    | Government-Furnished Property                              |              | 0        |          | 0          |           |
|    | SUBTOTAL   |              | 7,125    | 0        | 7,125      |           |
|    | Contingencies  | 10.0%        | 713      | 0        | 713        |           |
|    | SUBTOTAL   |              | 7,838    | 0        | 7,838      |           |
|    | SIOH (S&A)   | 5.0%         | 392      | 0        | 392        |           |
|    | CURRENT WORKING ESTIMATE                                   |              | 8,229    | 0        | 8,229      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-130

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | ** TOTAL DIRECT *<br>AMOUNT PCT | * SUBCON *<br>W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|---------------------------------|----------------------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 45     | 1,349 | 6         | 4,523    | 5,879 100.0%                    | 0                    | 5,879    |
|    | TOTAL DIRECT  |    |          |     | 45     | 1,349 | 6         | 4,523    | 5,879 100.0%                    |                      |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% OTHER% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|--------------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 5,879    | 588                        | 10.0% | 0.0   | 485                        | 7.5% | 2.5% 0.0%    | 7,125                                | 100.0% | 7125.11   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 588                        | 10.0% |       | 485                        | 7.5% |              |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT    | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-133



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT           | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0482E2

3-134

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP DESCRIPTION             | LIFE HRS | TL | HRLY | OWNRSH | OWNS | OVTH | OWNRSH | EXPENSE | HRLY RATE | UPB RATE | HOURS | TOTAL COST |
|-------------------------------|----------|----|------|--------|------|------|--------|---------|-----------|----------|-------|------------|
| EMI20 SMALL TOOLS             |          |    |      |        |      |      |        |         | 1.40      | 1.40     | 4     | 6          |
| TOTAL PROJECT EQUIPMENT HOURS |          |    |      |        |      |      |        |         |           |          | 4     | 6          |

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 482

TIME 15:00:07

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 45            | 1,349         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 45            | 1,349         |

\*\*\* END OF SUMMARY REPORT \*\*\*

# FORT KNOX LIMITED ENERGY STUDY

## ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

### FACILITY LIGHTING REPLACEMENT

BUILDING #: **483**  
BUILDING FUNCTION: **MOTOR POOL/VEHICLE MAINTENANCE**

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

#### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
120 2 LAMP @ 158 WATTS/FIXT = 18,960 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES  
TOTAL EXISTING KW  
TOTAL EXISTING KWH

1.76  
25.00  
19.0  
39,437

#### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS  
6 2 LAMP W/ 58 WATTS/FIXT = 348 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT  
AVERAGE FOOTCANDLES  
TOTAL REPLACEMENT KW  
TOTAL REPLACEMENT KWH

0.93  
30.00  
10.4  
21,690

NET ENERGY SAVINGS

60,551 MBTU/YR

NET DOLLAR SAVINGS

\$1,168.24

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:10:53

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 483

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S   E D I T I O N  
COMPOSER Plus Copyright (C) 1985, 1988  
by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-138

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

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| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
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| AA. ELECTRICAL.....            | 1           |

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Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 483  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:10:53

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY                        | UOM   | CREW | MANHR | LABOR          | EQUIPMENT | MATERIAL       | SALESTX     | DIRECT \$       |
|---|---------------------------------|-------|------|-------|----------------|-----------|----------------|-------------|-----------------|
| 16500 LIGHTING  |                                 |       |      |       |                |           |                |             |                 |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                                 |       |      |       |                |           |                |             |                 |
| CD=3 EL 8004 4 FOOT 2 LAMP<br>WC=1100                           | *** UNIT COSTS: ***<br>6.00 EA  | EELEF | 6    | 0.93  | 28.11<br>169   | 0.13<br>1 | 53.00<br>318   | 2.65<br>16  | 83.88<br>503    |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                                 |       |      |       |                |           |                |             |                 |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP<br>WC=1100              | *** UNIT COSTS: ***<br>42.00 EA | EELEF | 39   | 0.93  | 28.11<br>1,180 | 0.13<br>5 | 95.00<br>3,990 | 4.75<br>200 | 127.98<br>5,375 |
| TOTAL DIVISION 16 ELECTRICAL                                    |                                 |       | 45   |       | 1,349          | 6         | 4,308          | 215         | 5,879           |
| TOTAL FACILITY AA. ELECTRICAL                                   |                                 |       | 45   |       | 1,349          | 6         | 4,308          | 215         | 5,879           |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                                 |       | 45   |       | 1,349          | 6         | 4,308          | 215         | 5,879           |
| TOTAL BASE BID  |                                 |       | 45   |       | 1,349          | 6         | 4,308          | 215         | 5,879           |
| TOTAL ADDITIVE  |                                 |       | 0    |       | 0              | 0         | 0              | 0           | 0               |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                                 |       | 45   |       | 1,349          | 6         | 4,308          | 215         | 5,879           |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-140

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-141



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT      | BOND        | OTHER FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|-------------|------------|------------|-----------|
| AA             | ELECTRICAL |         |             |              |           |             |             |            |            |           |
|                |            | 1.00 EA | 5,879       | 10.0%<br>588 | 0.0%<br>0 | 7.5%<br>485 | 2.5%<br>174 | 0.0%<br>0  | 7,125      | 7125.11   |
| BID ITEM TOTAL |            | 1.00 EA | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      | 7125.11   |
| TOTAL BASE BID |            |         | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0           | 0          | 0          |           |
| TOTAL INCL ADD |            |         | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-142

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 483

TIME 15:10:53

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA  | 7,125    |          | 7,125      | 7125.10   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 7,125    | 0        | 7,125      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 7,125    | 0        | 7,125      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 7,125    | 0        | 7,125      |           |
|    | Contingencies  | 10.0%    |     | 713      | 0        | 713        |           |
|    | SUBTOTAL   |          |     | 7,838    | 0        | 7,838      |           |
|    | SIOH (S&A)   | 5.0%     |     | 392      | 0        | 392        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 8,229    | 0        | 8,229      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | ** TOTAL DIRECT ** | SUBCON | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|--------------------|--------|--------|----------|
|    |               |    |          |     |        |       |           |       |      | AMOUNT PCT         |        |        |          |
| AA | GENERAL/PRIME |    | 1.00     | EA  | 45     | 1,349 | 6         | 4,523 |      | 5,879 100.0%       | 0      |        | 5,879    |
|    | TOTAL DIRECT  |    |          |     | 45     | 1,349 | 6         | 4,523 |      | 5,879 100.0%       |        |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-144

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHR% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|-------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 5,879    | 588                        | 10.0% | 0.0   | 485                        | 7.5% | 2.5%  | 0.0%  | 7,125                                | 100.0% | 7125.11   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 588                        | 10.0% |       | 485                        | 7.5% |       |       |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-145

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT    | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-146

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT           | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2

3-147

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL **** |          |         |        |      |      |        |         |      |      |       |       |
|---|----------|---------|--------|------|------|--------|---------|------|------|-------|-------|
| EQUIP DESCRIPTION   | LIFE HRS | TL HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST  |
| -----   |          |         |        |      |      |        |         |      |      |       |       |
| EMI20 SMALL TOOLS   |          |         |        |      |      |        |         | 1.40 | 1.40 | 4     | 6     |
|   |          |         |        |      |      |        |         |      |      | ----- | ----- |
| TOTAL PROJECT EQUIPMENT HOURS   |          |         |        |      |      |        |         |      |      | 4     | 6     |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0483E2  
3-148

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 483

TIME 15:10:53

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 45            | 1,349         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 45            | 1,349         |

\* \* \* END OF SUMMARY REPORT \* \* \*



# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 484

BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

BUILDING USE:

HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
96 2 LAMP @ 158 WATTS/FIXT = 15,168 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.40  
AVERAGE FOOTCANDLES 20.00

TOTAL EXISTING KW 15.2  
TOTAL EXISTING KWH 31,549

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
6 2 LAMP W/ 58 WATTS/FIXT = 348 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.93  
AVERAGE FOOTCANDLES 30.00

TOTAL REPLACEMENT KW 10.4  
TOTAL REPLACEMENT KWH 21,690

NET ENERGY SAVINGS

33,640 MBTU/YR

NET DOLLAR SAVINGS

\$649.02

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:18:09

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 484

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-151

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

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| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 484  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:18:09

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |                     |     |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 6.00 EA EELEF       |     |      | 6     | 169   | 1         | 318      | 16      | 503       |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP                         | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 95.00    | 4.75    | 127.98    |
| WC=1100   | 42.00 EA EELEF      |     |      | 39    | 1,180 | 5         | 3,990    | 200     | 5,375     |
| TOTAL DIVISION 16 ELECTRICAL                                    |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL FACILITY AA. ELECTRICAL                                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BASE BID  |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL ADDITIVE  |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-153

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-154

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 484

TIME 15:18:09

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   | COST TO PRM | OVERHEAD | HOME OFC     | PROFIT    | BOND        | OTHER FCTR  | TOTAL COST | UNIT COST     |
|----------------|------------|-------------|----------|--------------|-----------|-------------|-------------|------------|---------------|
| AA             | ELECTRICAL | 1.00 EA     | 5,879    | 10.0%<br>588 | 0.0%<br>0 | 7.5%<br>485 | 2.5%<br>174 | 0.0%<br>0  | 7,125 7125.11 |
| BID ITEM TOTAL |            | 1.00 EA     | 5,879    | 588          | 0         | 485         | 174         | 0          | 7,125 7125.11 |
| TOTAL BASE BID |            |             | 5,879    | 588          | 0         | 485         | 174         | 0          | 7,125         |
| TOTAL ADDITIVE |            |             | 0        | 0            | 0         | 0           | 0           | 0          | 0             |
| TOTAL INCL ADD |            |             | 5,879    | 588          | 0         | 485         | 174         | 0          | 7,125         |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID   | BID ITEM                    | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|--|-----------------------------|--------------|----------|----------|------------|-----------|
| 1.   | BUILDING TO THE 5 FOOT LINE | 1.00 EA      | 7,125    |          | 7,125      | 7125.10   |
| TOTAL CURRENT CONTRACT COST                                |                             |              | 7,125    | 0        | 7,125      |           |
| Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 |                             | 0.0%         | 0        | 0        | 0          |           |
| ESCALATED CONTRACT COST                                    |                             |              | 7,125    | 0        | 7,125      |           |
| Government-Furnished Property                              |                             |              | 0        |          | 0          |           |
| SUBTOTAL   |                             |              | 7,125    | 0        | 7,125      |           |
| Contingencies  |                             | 10.0%        | 713      | 0        | 713        |           |
| SUBTOTAL   |                             |              | 7,838    | 0        | 7,838      |           |
| SIOH (S&A)   |                             | 5.0%         | 392      | 0        | 392        |           |
| CURRENT WORKING ESTIMATE                                   |                             |              | 8,229    | 0        | 8,229      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PH | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | ** TOTAL DIRECT *<br>AMOUNT PCT | * SUBCON *<br>W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|---------------------------------|----------------------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 45     | 1,349 | 6         | 4,523    | 5,879 100.0%                    | 0                    | 5,879    |
|    | TOTAL DIRECT  |    |          |     | 45     | 1,349 | 6         | 4,523    | 5,879 100.0%                    |                      |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-157



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ----- |               |    | *** OVERHEAD ***        |        |       | ----- |        |      | **** PROFIT **** |       |        | -----  |         |      | ***** TOTAL CONTRACT ***** |  |  |
|-------|---------------|----|-------------------------|--------|-------|-------|--------|------|------------------|-------|--------|--------|---------|------|----------------------------|--|--|
| ID    | CONTRACTOR    | PM | SUBTOTAL                | AMOUNT | PCT   | HOFC% | AMOUNT | PCT  | BOND%            | OTHR% | AMOUNT | PCT    | UNIT    | COST |                            |  |  |
| AA    | GENERAL/PRIME |    | 5,879                   | 588    | 10.0% | 0.0   | 485    | 7.5% | 2.5%             | 0.0%  | 7,125  | 100.0% | 7125.11 |      |                            |  |  |
|       |               |    |                         | -----  |       |       | -----  |      |                  |       |        |        |         |      |                            |  |  |
|       |               |    |                         | 588    | 10.0% |       | 485    | 7.5% |                  |       |        |        |         |      |                            |  |  |
|       |               |    | TOTAL OVERHEAD & PROFIT |        |       |       |        |      |                  |       |        |        |         |      |                            |  |  |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-158

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT    | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-159

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT           | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

TIME 15:18:09

## EQUIPMENT SUMMARY

SUMMARY PAGE 8

|                               |             | *** BOOK VALUE *** |         | ADJ FACTOR |      | ADJUSTD | BOOK OP | -- HRLY | --- UPB | **** TOTAL **** |       |       |
|-------------------------------|-------------|--------------------|---------|------------|------|---------|---------|---------|---------|-----------------|-------|-------|
| EQUIP                         | DESCRIPTION | LIFE HRS           | TL HRLY | OWNRSH     | OWNS | OVTM    | OWNRSH  | EXPENSE | RATE    | RATE            | HOURS | COST  |
| EMI20                         | SMALL TOOLS |                    |         |            |      |         |         |         | 1.40    | 1.40            | 4     | 6     |
|                               |             |                    |         |            |      |         |         |         |         |                 | ----- | ----- |
| TOTAL PROJECT EQUIPMENT HOURS |             |                    |         |            |      |         |         |         |         |                 | 4     | 6     |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-161

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 484

TIME 15:18:09

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TYS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 45            | 1,349         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 45            | 1,349         |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0484E2

3-162

# FORT KNOX LIMITED ENERGY STUDY

## ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

### FACILITY LIGHTING REPLACEMENT

BUILDING #: 485  
BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

#### BUILDING USE:

HOURS/DAY 8  
DAYS/WEEK 5

#### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

#### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
114 2 LAMP @ 158 WATTS/FIXT = 18,012 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.67  
AVERAGE FOOTCANDLES 20.00

TOTAL EXISTING KW 18.0  
TOTAL EXISTING KWH 37,465

NET ENERGY SAVINGS

53.823 MBTU/YR

#### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/  
REFLECTORS 37 WATTS/FIXT = 0 WATTS  
6 2 LAMP W/  
58 WATTS/FIXT = 348 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.93  
AVERAGE FOOTCANDLES 30.00

TOTAL REPLACEMENT KW 10.4  
TOTAL REPLACEMENT KWH 21,690

NET DOLLAR SAVINGS \$1,038.44

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:25:24

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 485

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-164

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

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| CONTRACTOR DIRECT SUMMARY.....     | 4            |
| CONTRACTOR INDIRECT SUMMARY.....   | 5            |
| CSI DIVISION SUMMARY.....          | 6            |
| SYSTEMS SUMMARY.....               | 7            |
| EQUIPMENT SUMMARY.....             | 8            |
| LABOR SUMMARY.....                 | 9            |

| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 485

TIME 15:25:24

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTY | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |                     |     |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 6.00 EA EELEF       |     |      | 6     | 169   | 1         | 318      | 16      | 503       |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP                         | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 95.00    | 4.75    | 127.98    |
| WC=1100   | 42.00 EA EELEF      |     |      | 39    | 1,180 | 5         | 3,990    | 200     | 5,375     |
| TOTAL DIVISION 16 ELECTRICAL                                    |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL FACILITY AA. ELECTRICAL                                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BASE BID  |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL ADDITIVE  |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-166

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-167

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT      | BOND        | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|-------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 5,879       | 10.0%<br>588 | 0.0%<br>0 | 7.5%<br>485 | 2.5%<br>174 | 0.0%<br>0 | 7,125      | 7125.11   |
| BID ITEM TOTAL |            | 1.00 EA | 5,879       | 588          | 0         | 485         | 174         | 0         | 7,125      | 7125.11   |
| TOTAL BASE BID |            |         | 5,879       | 588          | 0         | 485         | 174         | 0         | 7,125      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0           | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 5,879       | 588          | 0         | 485         | 174         | 0         | 7,125      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 485

TIME 15:25:24

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA  | 7,125    |          | 7,125      | 7125.10   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 7,125    | 0        | 7,125      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 7,125    | 0        | 7,125      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 7,125    | 0        | 7,125      |           |
|    | Contingencies  | 10.0%    |     | 713      | 0        | 713        |           |
|    | SUBTOTAL   |          |     | 7,838    | 0        | 7,838      |           |
|    | SIOH (S&A)   | 5.0%     |     | 392      | 0        | 392        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 8,229    | 0        | 8,229      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | ** TOTAL DIRECT ** | SUBCON | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|--------------------|--------|--------|----------|
|    |               |    |          |     |        |       |           |          | AMOUNT PCT         |        |        |          |
| AA | GENERAL/PRIME |    | 1.00     | EA  | 45     | 1,349 | 6         | 4,523    | 5,879 100.0%       | 0      |        | 5,879    |
|    | TOTAL DIRECT  |    |          |     | 45     | 1,349 | 6         | 4,523    | 5,879 100.0%       |        |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-170

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHR% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|-------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 5,879    | 588                        | 10.0% | 0.0   | 485                        | 7.5% | 2.5%  | 0.0%  | 7,125                                | 100.0% | 7125.11   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 588                        | 10.0% |       | 485                        | 7.5% |       |       |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-171

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT    | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-172

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT           | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-173



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL **** |          |    |      |        |      |      |        |         |      |      |            |
|---|----------|----|------|--------|------|------|--------|---------|------|------|------------|
| EQUIP DESCRIPTION   | LIFE HRS | TL | HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS COST |
| EMI20 SMALL TOOLS   |          |    |      |        |      |      |        |         | 1.40 | 1.40 | 4 6        |
| TOTAL PROJECT EQUIPMENT HOURS   |          |    |      |        |      |      |        |         |      |      | 4 6        |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-174

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 485

TIME 15:25:24

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 45            | 1,349         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 45            | 1,349         |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0485E2

3-175

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 486  
BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

BUILDING USE:

HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
93 2 LAMP @ 158 WATTS/FIXT = 14,694 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.36  
AVERAGE FOOTCANDLES 20.00

TOTAL EXISTING KW 14.7  
TOTAL EXISTING KWH 30,564

NET ENERGY SAVINGS 30.276 MBTU/YR

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
6 2 LAMP W/ 58 WATTS/FIXT = 348 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
42 FIXTURES @ 240 WATTS/FIXT = 10,080 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.93  
AVERAGE FOOTCANDLES 30.00

TOTAL REPLACEMENT KW 10.4  
TOTAL REPLACEMENT KWH 21,690

NET DOLLAR SAVINGS \$584.12

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 486 CONNECTOR  
BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
12 2 LAMP @ 96 WATTS/FIXT = 1,152 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
6 1 LAMP @ 454 WATTS/FIXT = 2,724 WATTS

AVERAGE WATTS/SQ FT 1.26  
AVERAGE FOOTCANDLES 25.00  
TOTAL EXISTING KW 3.9  
TOTAL EXISTING KWH 8,062

NET ENERGY SAVINGS 13,087 MBTU/YR

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTOR 37 WATTS/FIXT = 0 WATTS  
4 2 LAMP W/ 58 WATTS/FIXT = 232 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
6 FIXTURES @ 300 WATTS/FIXT = 1,800 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.59  
AVERAGE FOOTCANDLES 30.00  
TOTAL REPLACEMENT KW 2.0  
TOTAL REPLACEMENT KWH 4,227

NET DOLLAR SAVINGS \$252.49

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:40:45

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 486

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N  
COMPOSER Plus Copyright (C) 1985, 1988  
by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-178

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

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| AA. ELECTRICAL.....            | 1           |

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Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 486  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:40:45

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTY | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |                     |     |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 6.00 EA EELEF       |     |      | 6     | 169   | 1         | 318      | 16      | 503       |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP                         | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 95.00    | 4.75    | 127.98    |
| WC=1100   | 42.00 EA EELEF      |     |      | 39    | 1,180 | 5         | 3,990    | 200     | 5,375     |
| TOTAL DIVISION 16 ELECTRICAL                                    |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL FACILITY AA. ELECTRICAL                                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL BASE BID  |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |
| TOTAL ADDITIVE  |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                     |     |      | 45    | 1,349 | 6         | 4,308    | 215     | 5,879     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-180

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-181



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT      | BOND        | OTHER FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|-------------|------------|------------|-----------|
| AA             | ELECTRICAL |         |             |              |           |             |             |            |            |           |
|                |            | 1.00 EA | 5,879       | 10.0%<br>588 | 0.0%<br>0 | 7.5%<br>485 | 2.5%<br>174 | 0.0%<br>0  | 7,125      | 7125.11   |
| BID ITEM TOTAL |            | 1.00 EA | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      | 7125.11   |
| TOTAL BASE BID |            |         | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0           | 0          | 0          |           |
| TOTAL INCL ADD |            |         | 5,879       | 588          | 0         | 485         | 174         | 0          | 7,125      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-182

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 486

TIME 15:40:45

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00     | EA  | 7,125    |          | 7,125      | 7125.10   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 7,125    | 0        | 7,125      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 7,125    | 0        | 7,125      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 7,125    | 0        | 7,125      |           |
|    | Contingencies  | 10.0%    |     | 713      | 0        | 713        |           |
|    | SUBTOTAL   |          |     | 7,838    | 0        | 7,838      |           |
|    | SIOH (S&A)   | 5.0%     |     | 392      | 0        | 392        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 8,229    | 0        | 8,229      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-183

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PH | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | ** TOTAL DIRECT ** | AMOUNT | PCT | SUBCON | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|--------------------|--------|-----|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 45     | 1,349 | 6         | 4,523 |      | 5,879              | 100.0% |     | 0      | 5,879  |          |
|    | TOTAL DIRECT  |    |          |     | 45     | 1,349 | 6         | 4,523 |      | 5,879              | 100.0% |     |        |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-184

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PH | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHER% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|--------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 5,879    | 588                        | 10.0% | 0.0   | 485                        | 7.5% | 2.5%  | 0.0%   | 7,125                                | 100.0% | 7125.11   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 588                        | 10.0% |       | 485                        | 7.5% |       |        |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-185

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT    | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-186

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |
| TOTAL DIRECT           | 45       | 1,349 | 6         | 4,308    | 215       | 5,879                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-187

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR |    | ADJUSTD |        | BOOK OP -- |      | HRLY   | ---     | UPB  | **** | TOTAL | **** |
|-------------------------------|-------------|------------|----|---------|--------|------------|------|--------|---------|------|------|-------|------|
| EQUIP                         | DESCRIPTION | LIFE HRS   | TL | HRLY    | OWNRSH | OWNS       | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST |
| EMI20                         | SMALL TOOLS |            |    |         |        |            |      |        |         | 1.40 | 1.40 | 4     | 6    |
|                               |             |            |    |         |        |            |      |        |         |      |      | 4     | 6    |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |    |         |        |            |      |        |         |      |      |       |      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0486E2

3-188

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486

TIME 15:40:45

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 45            | 1,349         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 45            | 1,349         |

\*\*\* END OF SUMMARY REPORT \*\*\*



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:32:43

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N  
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by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-190

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

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| SYSTEMS SUMMARY.....               | 7            |
| EQUIPMENT SUMMARY.....             | 8            |
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| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 486 CONNECTOR  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:32:43

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |                     |     |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 4.00 EA EELEF       |     | 4    |       | 112   | 1         | 212      | 11      | 336       |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP                         | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 95.00    | 4.75    | 127.98    |
| WC=1100   | 6.00 EA EELEF       |     | 6    |       | 169   | 1         | 570      | 29      | 768       |
| TOTAL DIVISION 16 ELECTRICAL                                    |                     |     |      | 9     | 281   | 1         | 782      | 39      | 1,103     |
| TOTAL FACILITY AA. ELECTRICAL                                   |                     |     |      | 9     | 281   | 1         | 782      | 39      | 1,103     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                     |     |      | 9     | 281   | 1         | 782      | 39      | 1,103     |
| TOTAL BASE BID  |                     |     |      | 9     | 281   | 1         | 782      | 39      | 1,103     |
| TOTAL ADDITIVE  |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                     |     |      | 9     | 281   | 1         | 782      | 39      | 1,103     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-193

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT     | BOND       | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|------------|------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 1,103       | 10.0%<br>110 | 0.0%<br>0 | 7.5%<br>91 | 2.5%<br>33 | 0.0%<br>0 | 1,337      | 1337.41   |
| BID ITEM TOTAL |            | 1.00 EA | 1,103       | 110          | 0         | 91         | 33         | 0         | 1,337      | 1337.41   |
| TOTAL BASE BID |            |         | 1,103       | 110          | 0         | 91         | 33         | 0         | 1,337      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0          | 0          | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 1,103       | 110          | 0         | 91         | 33         | 0         | 1,337      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|--------------|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00 EA      | 1,337    |          | 1,337      | 1337.40   |
|    | TOTAL CURRENT CONTRACT COST                                |              | 1,337    | 0        | 1,337      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |              | 1,337    | 0        | 1,337      |           |
|    | Government-Furnished Property                              |              | 0        |          | 0          |           |
|    | SUBTOTAL   |              | 1,337    | 0        | 1,337      |           |
|    | Contingencies  | 10.0%        | 134      | 0        | 134        |           |
|    | SUBTOTAL   |              | 1,471    | 0        | 1,471      |           |
|    | SIOH (S&A)   | 5.0%         | 74       | 0        | 74         |           |
|    | CURRENT WORKING ESTIMATE                                   |              | 1,545    | 0        | 1,545      |           |
|    | Estimated Construction Time                                | 365 Days     |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT | W/TX | ** TOTAL DIRECT | ** SUBCON | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-----|------|-----------------|-----------|--------|----------|
|    |               |    |          |     |        |       |           |     |      | AMOUNT          | PCT       |        |          |
| AA | GENERAL/PRIME |    | 1.00     | EA  | 9      | 281   | 1         | 821 |      | 1,103           | 100.0%    | 0      | 1,103    |
|    | TOTAL DIRECT  |    |          |     | 9      | 281   | 1         | 821 |      | 1,103           | 100.0%    |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PH | SUBTOTAL | *** OVERHEAD *** | AMOUNT | PCT | HOFC% | **** PROFIT **** | AMOUNT | PCT  | BOND% | OTHR% | ***** TOTAL CONTRACT ***** | AMOUNT | PCT | UNIT COST |
|----|-------------------------|----|----------|------------------|--------|-----|-------|------------------|--------|------|-------|-------|----------------------------|--------|-----|-----------|
| AA | GENERAL/PRIME           |    | 1,103    | 110              | 10.0%  | 0.0 |       | 91               | 7.5%   | 2.5% | 0.0%  |       | 1,337                      | 100.0% |     | 1337.40   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 110              | 10.0%  |     |       | 91               | 7.5%   |      |       |       |                            |        |     |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 9        | 281   | 1         | 782      | 39        | 1,103                   |
| TOTAL DIRECT    | 9        | 281   | 1         | 782      | 39        | 1,103                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-198

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 9        | 281   | 1         | 782      | 39        | 1,103                   |
| TOTAL DIRECT           | 9        | 281   | 1         | 782      | 39        | 1,103                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-199

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL **** |          |    |      |        |      |      |        |         |      |      |       |      |   |
|---|----------|----|------|--------|------|------|--------|---------|------|------|-------|------|---|
| EQUIP DESCRIPTION   | LIFE HRS | TL | HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST |   |
| -----   |          |    |      |        |      |      |        |         |      |      |       |      |   |
| EMI20 SMALL TOOLS   |          |    |      |        |      |      |        |         | 1.40 | 1.40 | 1     | 1    |   |
|   |          |    |      |        |      |      |        |         |      |      | ----- |      |   |
| TOTAL PROJECT EQUIPMENT HOURS   |          |    |      |        |      |      |        |         |      |      |       | 1    | 1 |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2

3-200

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 486 CONNECTOR

TIME 15:32:43

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 9             | 281           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 9             | 281           |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 486CE2  
3-201

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 487 AREA 3  
BUILDING FUNCTION: MOTOR POOL/VEHICLE MAINTENANCE

### BUILDING USE:

HOURS/DAY 8  
DAYS/WEEK 5

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
0 2 LAMP @ 96 WATTS/FIXT = 0 WATTS  
0 4 LAMP @ 192 WATTS/FIXT = 0 WATTS  
8 FOOT  
32 2 LAMP @ 158 WATTS/FIXT = 5,056 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 1.40  
AVERAGE FOOTCANDLES 20.00

TOTAL EXISTING KW 5.1  
TOTAL EXISTING KWH 10,516

NET ENERGY SAVINGS 11.213 MBTU/YR

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
2 2 LAMP W/ 58 WATTS/FIXT = 116 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
14 FIXTURES @ 240 WATTS/FIXT = 3,360 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.93  
AVERAGE FOOTCANDLES 30.00

TOTAL REPLACEMENT KW 3.5  
TOTAL REPLACEMENT KWH 7,290

NET DOLLAR SAVINGS \$216.34

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:48:02

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N  
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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-203

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

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| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 487 AREA 3  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:48:02

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |                     |     |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 2.00 EA EELEF       |     | 2    | 56    | 0     | 106       | 5        | 168     |           |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9003 200 W HPS FIXTURE AND LAMP                         | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 95.00    | 4.75    | 127.98    |
| WC=1100   | 14.00 EA EELEF      |     | 13   | 393   | 2     | 1,330     | 67       | 1,792   |           |
| TOTAL DIVISION 16 ELECTRICAL                                    |                     |     | 15   | 450   | 2     | 1,436     | 72       | 1,960   |           |
| TOTAL FACILITY AA. ELECTRICAL                                   |                     |     | 15   | 450   | 2     | 1,436     | 72       | 1,960   |           |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                     |     | 15   | 450   | 2     | 1,436     | 72       | 1,960   |           |
| TOTAL BASE BID  |                     |     | 15   | 450   | 2     | 1,436     | 72       | 1,960   |           |
| TOTAL ADDITIVE  |                     |     | 0    | 0     | 0     | 0         | 0        | 0       |           |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                     |     | 15   | 450   | 2     | 1,436     | 72       | 1,960   |           |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-205



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-206

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   | COST TO PRM | OVERHEAD | HOME OFC     | PROFIT    | BOND        | OTHR FCTR  | TOTAL COST | UNIT COST     |
|----------------|------------|-------------|----------|--------------|-----------|-------------|------------|------------|---------------|
| AA             | ELECTRICAL | 1.00 EA     | 1,960    | 10.0%<br>196 | 0.0%<br>0 | 7.5%<br>162 | 2.5%<br>58 | 0.0%<br>0  | 2,375 2375.04 |
| BID ITEM TOTAL | 1.00 EA    | 1,960       | 196      | 0            | 162       | 58          | 0          | 2,375      | 2375.04       |
| TOTAL BASE BID |            | 1,960       | 196      | 0            | 162       | 58          | 0          | 2,375      |               |
| TOTAL ADDITIVE |            | 0           | 0        | 0            | 0         | 0           | 0          | 0          |               |
| TOTAL INCL ADD |            | 1,960       | 196      | 0            | 162       | 58          | 0          | 2,375      |               |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-207

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|--------------|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00 EA      | 2,375    |          | 2,375      | 2375.00   |
|    | TOTAL CURRENT CONTRACT COST                                |              | 2,375    | 0        | 2,375      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |              | 2,375    | 0        | 2,375      |           |
|    | Government-Furnished Property                              |              | 0        |          | 0          |           |
|    | SUBTOTAL   |              | 2,375    | 0        | 2,375      |           |
|    | Contingencies  | 10.0%        | 238      | 0        | 238        |           |
|    | SUBTOTAL   |              | 2,613    | 0        | 2,613      |           |
|    | SIOH (S&A)   | 5.0%         | 131      | 0        | 131        |           |
|    | CURRENT WORKING ESTIMATE                                   |              | 2,743    | 0        | 2,743      |           |
|    | Estimated Construction Time                                | 365 Days     |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-208

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PH | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | ** TOTAL DIRECT ** | SUBCON * | SUBTOTAL |       |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|--------------------|----------|----------|-------|
|    |               |    |          |     |        |       |           |       |      | AMOUNT             | PCT      | W/OH&P   |       |
| AA | GENERAL/PRIME |    | 1.00     | EA  | 15     | 450   | 2         | 1,508 |      | 1,960              | 100.0%   | 0        | 1,960 |
|    | TOTAL DIRECT  |    |          |     | 15     | 450   | 2         | 1,508 |      | 1,960              | 100.0%   |          |       |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-209

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PH | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHER% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|--------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 1,960    | 196                        | 10.0% | 0.0   | 162                        | 7.5% | 2.5%  | 0.0%   | 2,375                                | 100.0% | 2375.04   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 196                        | 10.0% |       | 162                        | 7.5% |       |        |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-210

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 15       | 450   | 2         | 1,436    | 72        | 1,960                   |
| TOTAL DIRECT    | 15       | 450   | 2         | 1,436    | 72        | 1,960                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-211

Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 15       | 450   | 2         | 1,436    | 72        | 1,960                   |
| TOTAL DIRECT           | 15       | 450   | 2         | 1,436    | 72        | 1,960                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-212

## EQUIPMENT SUMMARY

SUMMARY PAGE 8

|                               |             | *** BOOK VALUE *** |         | ADJ FACTOR | ADJUSTD | BOOK OP | -- HRLY | --- UPB | **** TOTAL **** |      |       |       |   |   |
|-------------------------------|-------------|--------------------|---------|------------|---------|---------|---------|---------|-----------------|------|-------|-------|---|---|
| EQUIP                         | DESCRIPTION | LIFE HRS           | TL HRLY | OWNRSH     | OWNS    | OVTM    | OWNRSH  | EXPENSE | RATE            | RATE | HOURS | COST  |   |   |
| EMI20                         | SMALL TOOLS |                    |         |            |         |         |         |         | 1.40            | 1.40 | 1     | 2     |   |   |
|                               |             |                    |         |            |         |         |         |         |                 |      | ----- | ----- |   |   |
| TOTAL PROJECT EQUIPMENT HOURS |             |                    |         |            |         |         |         |         |                 |      |       |       | 1 | 2 |



Tue 14 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 487 AREA 3

TIME 15:48:02

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 15            | 450           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 15            | 450           |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 0487E2

3-214

# FORT KNOX LIMITED ENERGY STUDY

ECO 2: IMPROVE LIGHTING WITH ENERGY EFFICIENCY LIGHTING

30 SEPTEMBER 1993

## FACILITY LIGHTING REPLACEMENT

BUILDING #: 5232  
BUILDING FUNCTION: MAINTENANCE SHOP/STORAGE

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING FIXTURE DATA

4 FOOT  
0 1 LAMP @ 48 WATTS/FIXT = 0 WATTS  
18 2 LAMP @ 96 WATTS/FIXT = 1,728 WATTS  
3 4 LAMP @ 192 WATTS/FIXT = 576 WATTS  
8 FOOT  
0 2 LAMP @ 158 WATTS/FIXT = 0 WATTS  
INCANDESCENT  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
0 1 LAMP @ 0 WATTS/FIXT = 0 WATTS  
MERCURY VAPOR  
0 1 LAMP @ 454 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.71  
AVERAGE FOOTCANDLES 7.00

TOTAL EXISTING KW 2.3  
TOTAL EXISTING KWH 4,792

### REPLACEMENT FIXTURE DATA

4 FOOT  
0 1 LAMP @ 37 WATTS/FIXT = 0 WATTS  
0 1 LAMP W/ REFLECTORS 37 WATTS/FIXT = 0 WATTS  
2 2 LAMP W/ 58 WATTS/FIXT = 116 WATTS  
METAL HALIDE  
0 FIXTURES @ 185 WATTS/FIXT = 0 WATTS  
0 FIXTURES @ 215 WATTS/FIXT = 0 WATTS  
HIGH PRESSURE SODIUM  
0 FIXTURES @ 115 WATTS/FIXT = 0 WATTS  
8 FIXTURES @ 188 WATTS/FIXT = 1,504 WATTS  
0 FIXTURES @ 465 WATTS/FIXT = 0 WATTS

AVERAGE WATTS/SQ FT 0.70  
AVERAGE FOOTCANDLES 15.00

TOTAL REPLACEMENT KW 1.6  
TOTAL REPLACEMENT KWH 3,970

NET ENERGY SAVINGS

4,854 MBTU/YR

NET DOLLAR SAVINGS

\$93.66

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 13:01:09

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-2: BUILDING 5232

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S   E D I T I O N  
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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-216

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

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Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 5232  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 13:01:09

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY            | UOM | CREW | MANHR | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|---------------------|-----|------|-------|-------|-----------|----------|---------|-----------|
| 16500 LIGHTING  |                     |     |      |       |       |           |          |         |           |
| 16512 8000 FLUORESCENT - SURFACE MOUNTED T8 ELECTRONIC BALLASTS |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 8004 4 FOOT 2 LAMP                                      | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 53.00    | 2.65    | 83.88     |
| WC=1100   | 2.00 EA EELEF       |     |      | 2     | 56    | 0         | 106      | 5       | 168       |
| 16512 9000 HIGH INTENSITY DISCHARGE                             |                     |     |      |       |       |           |          |         |           |
| CD=3 EL 9005 150 W HPS FIXTURE AND LAMP                         | *** UNIT COSTS: *** |     |      | 0.93  | 28.11 | 0.13      | 89.00    | 4.45    | 121.68    |
| WC=1100   | 8.00 EA EELEF       |     |      | 7     | 225   | 1         | 712      | 36      | 973       |
| TOTAL DIVISION 16 ELECTRICAL                                    |                     |     |      | 9     | 281   | 1         | 818      | 41      | 1,141     |
| TOTAL FACILITY AA. ELECTRICAL                                   |                     |     |      | 9     | 281   | 1         | 818      | 41      | 1,141     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                   |                     |     |      | 9     | 281   | 1         | 818      | 41      | 1,141     |
| TOTAL BASE BID  |                     |     |      | 9     | 281   | 1         | 818      | 41      | 1,141     |
| TOTAL ADDITIVE  |                     |     |      | 0     | 0     | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                             |                     |     |      | 9     | 281   | 1         | 818      | 41      | 1,141     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-218

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-2: ENERGY EFFICIENT LIGHTING

SCOPE OF WORK: EVALUATE USE OF HIGHER EFFICIENCY INTERIOR LIGHTING IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-219

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT     | BOND       | OTHER FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|------------|------------|------------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 1,141       | 10.0%<br>114 | 0.0%<br>0 | 7.5%<br>94 | 2.5%<br>34 | 0.0%<br>0  | 1,383      | 1383.22   |
| BID ITEM TOTAL |            | 1.00 EA | 1,141       | 114          | 0         | 94         | 34         | 0          | 1,383      | 1383.22   |
| TOTAL BASE BID |            |         | 1,141       | 114          | 0         | 94         | 34         | 0          | 1,383      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0          | 0          | 0          | 0          |           |
| TOTAL INCL ADD |            |         | 1,141       | 114          | 0         | 94         | 34         | 0          | 1,383      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2  
3-220

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-2: BUILDING 5232

TIME 13:01:09

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|--------------|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00 EA      | 1,383    |          | 1,383      | 1383.20   |
|    | TOTAL CURRENT CONTRACT COST                                |              | 1,383    | 0        | 1,383      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |              | 1,383    | 0        | 1,383      |           |
|    | Government-Furnished Property                              |              | 0        |          | 0          |           |
|    | SUBTOTAL   |              | 1,383    | 0        | 1,383      |           |
|    | Contingencies  | 10.0%        | 138      | 0        | 138        |           |
|    | SUBTOTAL   |              | 1,522    | 0        | 1,522      |           |
|    | SIOH (S&A)   | 5.0%         | 76       | 0        | 76         |           |
|    | CURRENT WORKING ESTIMATE                                   |              | 1,598    | 0        | 1,598      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-221



Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT | W/TX | ** TOTAL DIRECT *<br>AMOUNT PCT | * SUBCON *<br>W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-----|------|---------------------------------|----------------------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 9      | 281   | 1         | 859 |      | 1,141 100.0%                    | 0                    | 1,141    |
|    | TOTAL DIRECT  |    |          |     | 9      | 281   | 1         | 859 |      | 1,141 100.0%                    |                      |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-222

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

|    |               |    | *** OVERHEAD ***        |        |       | **** PROFIT **** |        |      |       | ***** TOTAL CONTRACT ***** |        |        |           |
|----|---------------|----|-------------------------|--------|-------|------------------|--------|------|-------|----------------------------|--------|--------|-----------|
| ID | CONTRACTOR    | PM | SUBTOTAL                | AMOUNT | PCT   | HOFC%            | AMOUNT | PCT  | BOND% | OTHR%                      | AMOUNT | PCT    | UNIT COST |
| AA | GENERAL/PRIME |    | 1,141                   | 114    | 10.0% | 0.0              | 94     | 7.5% | 2.5%  | 0.0%                       | 1,383  | 100.0% | 1383.22   |
|    |               |    |                         | -----  |       |                  | -----  |      |       |                            |        |        |           |
|    |               |    |                         | 114    | 10.0% |                  | 94     | 7.5% |       |                            |        |        |           |
|    |               |    | TOTAL OVERHEAD & PROFIT |        |       |                  |        |      |       |                            |        |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-223

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 9        | 281   | 1         | 818      | 41        | 1,141                   |
| TOTAL DIRECT    | 9        | 281   | 1         | 818      | 41        | 1,141                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-224

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

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SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 9        | 281   | 1         | 818      | 41        | 1,141                   |
| TOTAL DIRECT           | 9        | 281   | 1         | 818      | 41        | 1,141                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-225

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP DESCRIPTION             | LIFE HRS | TL HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | HRLY RATE | UPB RATE | HOURS | TOTAL COST |
|-------------------------------|----------|---------|--------|------|------|--------|---------|-----------|----------|-------|------------|
| EMI20 SMALL TOOLS             |          |         |        |      |      |        |         | 1.40      | 1.40     | 1     | 1          |
| TOTAL PROJECT EQUIPMENT HOURS |          |         |        |      |      |        |         |           |          | 1     | 1          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-226

Thu 16 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-2: BUILDING 5232

TIME 13:01:09

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 9             | 281           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 9             | 281           |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 5232K2

3-227

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 86 - CENTER ISLE  
BUILDING FUNCTION: WAREHOUSE  
BUILDING USE: HOURS/DAY 9.6  
DAYS/WEEK 5

EXISTING FIXTURE DATA:  
LAMP TYPE: HIGH PRESSURE SODIUM  
FIXTURE WATTAGE: 465 WATTS  
NUMBER OF FIXTURES: 6  
ELECTRIC COSTS:  
ENERGY CHARGE: \$0.02506 PER KWH  
DEMAND CHARGE: \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
6 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,496 HR/YR = 6,964 KWH/YR

TOTAL EXISTING KWH 6,964

### REVISED LIGHTING CONTROL DATA

6 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 2,246 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
6 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 250 HR/YR = 697 KWH/YR

TOTAL REVISED CONTROL KWH 697

NET ENERGY SAVINGS

21.38 MBTU/YR

NET DOLLAR SAVINGS

\$394 /YR

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 86 - STORAGE ISLES  
BUILDING FUNCTION: WAREHOUSE  
BUILDING USE: HOURS/DAY 9.6  
DAYS/WEEK 5

EXISTING FIXTURE DATA:  
LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 240 WATTS  
NUMBER OF FIXTURES 36  
ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.240 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
36 FIXTS. @ 0.240 KW @ 100% OUTPUT \* 2,496 HR/YR = 21,565 KWH/YR

TOTAL EXISTING KWH

21,565

### REVISED LIGHTING CONTROL DATA

16 FIXTS. @ 0.240 KW @ 0% OUTPUT \* 2,246 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.240 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
16 FIXTS. @ 0.240 KW @ 100% OUTPUT \* 250 HR/YR = 960 KWH/YR  
20 FIXTS. @ 0.240 KW @ 100% OUTPUT \* 2,496 HR/YR = 11,981 KWH/YR

TOTAL REVISED CONTROL KWH

12,941

NET ENERGY SAVINGS

29.43 MBTU/YR

NET DOLLAR SAVINGS

\$542 /YR



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:21:30

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 86

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N  
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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-230

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

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DETAILED ESTIMATE

DETAIL PAGE

|                                |   |
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| 1. BUILDING TO THE 5 FOOT LINE |   |
| AA. ELECTRICAL.....            | 1 |

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|----------|-----|------|-------|--------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |          |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |          |     |      |       |        |           |          |         |           |
| CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***       | 7.14     |     |      |       | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100 1.80 MLF EELEF  | 13       |     |      |       | 388    | 2         | 131      | 7       | 527       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |          |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |          |     |      |       |        |           |          |         |           |
| CD=3 EL 2003 PHOTOCCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***          | 0.63     |     |      |       | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100 BASED ON FOOTCANDLE READING 5.00 EA EELEB                       | 3        |     |      |       | 103    | 0         | 3,000    | 150     | 3,254     |
| CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***          | 1.25     |     |      |       | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100 ON/OFF PHOTOCCELL CONTROL 18.00 EA EELEB                        | 23       |     |      |       | 743    | 3         | 1,800    | 90      | 2,636     |
| TOTAL DIVISION 16 ELECTRICAL  | 38       |     |      |       | 1,234  | 5         | 4,931    | 247     | 6,416     |
| TOTAL FACILITY AA. ELECTRICAL   | 38       |     |      |       | 1,234  | 5         | 4,931    | 247     | 6,416     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           | 38       |     |      |       | 1,234  | 5         | 4,931    | 247     | 6,416     |
| TOTAL BASE BID  | 38       |     |      |       | 1,234  | 5         | 4,931    | 247     | 6,416     |
| TOTAL ADDITIVE  | 0        |     |      |       | 0      | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     | 38       |     |      |       | 1,234  | 5         | 4,931    | 247     | 6,416     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-232

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-233

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 86

TIME 14:21:30

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   | COST TO PRM | OVERHEAD | HOME OFC     | PROFIT    | BOND        | OTHR        | FCTR      | TOTAL COST | UNIT COST |
|----------------|------------|-------------|----------|--------------|-----------|-------------|-------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA     | 6,416    | 10.0%<br>642 | 0.0%<br>0 | 7.5%<br>529 | 2.5%<br>190 | 0.0%<br>0 | 7,777      | 7776.63   |
| BID ITEM TOTAL |            | 1.00 EA     | 6,416    | 642          | 0         | 529         | 190         | 0         | 7,777      | 7776.63   |
| TOTAL BASE BID |            |             | 6,416    | 642          | 0         | 529         | 190         | 0         | 7,777      |           |
| TOTAL ADDITIVE |            |             | 0        | 0            | 0         | 0           | 0           | 0         | 0          |           |
| TOTAL INCL ADD |            |             | 6,416    | 642          | 0         | 529         | 190         | 0         | 7,777      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-234

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 86

TIME 14:21:30

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM  | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|------|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA   | 7,777    |          | 7,777      | 7776.60   |
|    | TOTAL CURRENT CONTRACT COST                                |          |      | 7,777    | 0        | 7,777      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |      | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |      | 7,777    | 0        | 7,777      |           |
|    | Government-Furnished Property                              |          |      | 0        |          | 0          |           |
|    | SUBTOTAL   |          |      | 7,777    | 0        | 7,777      |           |
|    | Contingencies  | 10.0%    |      | 778      | 0        | 778        |           |
|    | SUBTOTAL   |          |      | 8,554    | 0        | 8,554      |           |
|    | SIOH (S&A)   | 5.0%     |      | 428      | 0        | 428        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |      | 8,982    | 0        | 8,982      |           |
|    | Estimated Construction Time                                | 365      | Days |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-235

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 38     | 1,234 | 5         | 5,177 |      | 6,416  | 100.0% | 0      | 6,416    |
|    | TOTAL DIRECT  |    |          |     | 38     | 1,234 | 5         | 5,177 |      | 6,416  | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-236

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

|    |               | *** OVERHEAD *** |                         |        | **** PROFIT **** |       |        | ***** TOTAL CONTRACT ***** |       |       |        |        |           |
|----|---------------|------------------|-------------------------|--------|------------------|-------|--------|----------------------------|-------|-------|--------|--------|-----------|
| ID | CONTRACTOR    | PM               | SUBTOTAL                | AMOUNT | PCT              | HOFC% | AMOUNT | PCT                        | BOND% | OTHR% | AMOUNT | PCT    | UNIT COST |
| AA | GENERAL/PRIME |                  | 6,416                   | 642    | 10.0%            | 0.0   | 529    | 7.5%                       | 2.5%  | 0.0%  | 7,777  | 100.0% | 7776.62   |
|    |               |                  |                         | 642    | 10.0%            |       | 529    | 7.5%                       |       |       |        |        |           |
|    |               |                  | TOTAL OVERHEAD & PROFIT |        |                  |       |        |                            |       |       |        |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-237



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 38       | 1,234 | 5         | 4,931    | 247       | 6,416                   |
| TOTAL DIRECT    | 38       | 1,234 | 5         | 4,931    | 247       | 6,416                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-238

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 38       | 1,234 | 5         | 4,931    | 247       | 6,416                   |
| TOTAL DIRECT           | 38       | 1,234 | 5         | 4,931    | 247       | 6,416                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-239

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR |    | ADJUSTD |        | BOOK OP |      | --     | HRLY    | ---  | UPB  | ****  | TOTAL | **** |
|-------------------------------|-------------|------------|----|---------|--------|---------|------|--------|---------|------|------|-------|-------|------|
| EQUIP                         | DESCRIPTION | LIFE HRS   | TL | HRLY    | OWNRSH | OWNS    | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST  |      |
| EMI20                         | SMALL TOOLS |            |    |         |        |         |      |        |         | 1.40 | 1.40 | 4     | 5     |      |
|                               |             |            |    |         |        |         |      |        |         |      |      | 4     | 5     |      |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |    |         |        |         |      |        |         |      |      |       |       |      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-240

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 86

TIME 14:21:30

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 38            | 1,234         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 38            | 1,234         |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 086E31

3-241

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 94  
BUILDING FUNCTION: WAREHOUSE/MAINTENANCE SHOP

BUILDING USE:  
HOURS/DAY 10  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 465 WATTS  
NUMBER OF FIXTURES 108

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
108 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,600 HR/YR = 130,572 KWH/YR

TOTAL EXISTING KWH 130,572

### REVISED LIGHTING CONTROL DATA

72 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 2,350 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
108 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 250 HR/YR = 12,555 KWH/YR  
36 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,350 HR/YR = 39,339 KWH/YR

TOTAL REVISED CONTROL KWH 51,894

NET ENERGY SAVINGS 260.45 MBTU/YR

NET DOLLAR SAVINGS

\$4,811 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 13:55:40

TITLE PAGE

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LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 94

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-243

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

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| CONTRACTOR DIRECT SUMMARY.....     | 4            |
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| EQUIPMENT SUMMARY.....             | 8            |
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| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 94  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 13:55:40

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY | UOM | CREW | MANHR  | LABOR | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|----------|-----|------|--------|-------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |          |     |      |        |       |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |          |     |      |        |       |           |          |         |           |
| CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***       | 7.14     |     |      | 215.37 | 0.97  | 72.72     | 3.64     | 292.69  |           |
| WC=1100 1.08 MLF EELEF  | 8        |     |      | 233    | 1     | 79        | 4        | 316     |           |
| 16900 CONTROLS AND INSTRUMENTATION                                      |          |     |      |        |       |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |          |     |      |        |       |           |          |         |           |
| CD=3 EL 2003 PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***           | 0.63     |     |      | 20.63  | 0.08  | 600.00    | 30.00    | 650.71  |           |
| WC=1100 BASED ON FOOTCANDLE READING 3.00 EA EELEB                       | 2        |     |      | 62     | 0     | 1,800     | 90       | 1,952   |           |
| CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***          | 1.25     |     |      | 41.26  | 0.16  | 100.00    | 5.00     | 146.42  |           |
| WC=1100 ON/OFF PHOTOCELL CONTROL 18.00 EA EELEB                         | 23       |     |      | 743    | 3     | 1,800     | 90       | 2,636   |           |
| TOTAL DIVISION 16 ELECTRICAL  | 32       |     |      | 1,037  | 4     | 3,679     | 184      | 4,904   |           |
| TOTAL FACILITY AA. ELECTRICAL   | 32       |     |      | 1,037  | 4     | 3,679     | 184      | 4,904   |           |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           | 32       |     |      | 1,037  | 4     | 3,679     | 184      | 4,904   |           |
| TOTAL BASE BID  | 32       |     |      | 1,037  | 4     | 3,679     | 184      | 4,904   |           |
| TOTAL ADDITIVE  | 0        |     |      | 0      | 0     | 0         | 0        | 0       |           |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     | 32       |     |      | 1,037  | 4     | 3,679     | 184      | 4,904   |           |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-245



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-246

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD | HOME OFC | PROFIT | BOND | OTHER FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|----------|----------|--------|------|------------|------------|-----------|
| AA             | ELECTRICAL |         |             | 10.0%    | 0.0%     | 7.5%   | 2.5% | 0.0%       |            |           |
|                |            | 1.00 EA | 4,904       | 490      | 0        | 405    | 145  | 0          | 5,944      | 5943.80   |
| BID ITEM TOTAL |            | 1.00 EA | 4,904       | 490      | 0        | 405    | 145  | 0          | 5,944      | 5943.80   |
| TOTAL BASE BID |            |         | 4,904       | 490      | 0        | 405    | 145  | 0          | 5,944      |           |
| TOTAL ADDITIVE |            |         | 0           | 0        | 0        | 0      | 0    | 0          | 0          |           |
| TOTAL INCL ADD |            |         | 4,904       | 490      | 0        | 405    | 145  | 0          | 5,944      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-247

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00     | EA  | 5,944    |          | 5,944      | 5943.80   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 5,944    | 0        | 5,944      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 5,944    | 0        | 5,944      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 5,944    | 0        | 5,944      |           |
|    | Contingencies  | 10.0%    |     | 594      | 0        | 594        |           |
|    | SUBTOTAL   |          |     | 6,538    | 0        | 6,538      |           |
|    | SIOH (S&A)   | 5.0%     |     | 327      | 0        | 327        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 6,865    | 0        | 6,865      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-248

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | ** TOTAL DIRECT ** | SUBCON | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|--------------------|--------|--------|----------|
|    |               |    |          |     |        |       |           |          | AMOUNT PCT         |        |        |          |
| AA | GENERAL/PRIME |    | 1.00     | EA  | 32     | 1,037 | 4         | 3,862    | 4,904 100.0%       | 0      |        | 4,904    |
|    | TOTAL DIRECT  |    |          |     | 32     | 1,037 | 4         | 3,862    | 4,904 100.0%       |        |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-249

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID CONTRACTOR           |               | PM | SUBTOTAL | *** OVERHEAD *** |       | **** PROFIT **** |        | ***** TOTAL CONTRACT ***** |              | UNIT COST    |         |
|-------------------------|---------------|----|----------|------------------|-------|------------------|--------|----------------------------|--------------|--------------|---------|
|                         |               |    |          | AMOUNT           | PCT   | HOFC%            | AMOUNT | PCT                        | BOND% OTHER% | AMOUNT PCT   |         |
| AA                      | GENERAL/PRIME |    | 4,904    | 490              | 10.0% | 0.0              | 405    | 7.5%                       | 2.5% 0.0%    | 5,944 100.0% | 5943.79 |
| TOTAL OVERHEAD & PROFIT |               |    |          | 490              | 10.0% |                  | 405    | 7.5%                       |              |              |         |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-250

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 32       | 1,037 | 4         | 3,679    | 184       | 4,904                   |
| TOTAL DIRECT    | 32       | 1,037 | 4         | 3,679    | 184       | 4,904                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-251

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 32       | 1,037 | 4         | 3,679    | 184       | 4,904                   |
| TOTAL DIRECT           | 32       | 1,037 | 4         | 3,679    | 184       | 4,904                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-252

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP DESCRIPTION             | LIFE HRS | TL | HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | RATE | UPB  | HOURS | TOTAL | COST |
|-------------------------------|----------|----|------|--------|------|------|--------|---------|------|------|-------|-------|------|
| EMI20 SMALL TOOLS             |          |    |      |        |      |      |        |         | 1.40 | 1.40 | 3     | 4     |      |
| TOTAL PROJECT EQUIPMENT HOURS |          |    |      |        |      |      |        |         |      |      | 3     | 4     |      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-253



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 94

TIME 13:55:40

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 32            | 1,038         |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 32            | 1,038         |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 094E31

3-254

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 158  
BUILDING FUNCTION: MOTOR REPAIR SHOP  
BUILDING USE: HOURS/DAY 8.5  
DAYS/WEEK 5

EXISTING FIXTURE DATA:  
LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 465 WATTS  
NUMBER OF FIXTURES 63  
ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
63 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,210 HR/YR = 64,742 KWH/YR

TOTAL EXISTING KWH 64,742

### REVISED LIGHTING CONTROL DATA

36 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 1,960 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
63 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 250 HR/YR = 7,324 KWH/YR  
27 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 1,960 HR/YR = 24,608 KWH/YR

TOTAL REVISED CONTROL KWH 31,932

NET ENERGY SAVINGS 111.95 MBTU/YR

NET DOLLAR SAVINGS

\$2,242 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:11:43

TITLE PAGE

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LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 158

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-256

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 158

TIME 14:11:43

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|                                |   |
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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 158  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 14:11:43

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  |                                      | QUANTITY            | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|--------------------------------------|---------------------|-----|------|-------|--------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |                                      |                     |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |                                      |                     |     |      |       |        |           |          |         |           |
| CD=4 EL 1102  | NO. 12 AWG - TYPE THW INSULATION *** | UNIT COSTS: ***     |     |      | 7.14  | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100   |                                      | 1.08 MLF EELEF      |     | 8    |       | 233    | 1         | 79       | 4       | 316       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |                                      |                     |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |                                      |                     |     |      |       |        |           |          |         |           |
| CD=3 EL 2003  | PHOTOCELL FOR ON/OFF CONTROL         | *** UNIT COSTS: *** |     |      | 0.63  | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100   | BASED ON FOOTCANDLE READING          | 3.00 EA EELEB       |     | 2    |       | 62     | 0         | 1,800    | 90      | 1,952     |
| CD=3 EL 2004  | CIRCUIT FOR CONTROL PANEL FOR        | *** UNIT COSTS: *** |     |      | 1.25  | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100   | ON/OFF PHOTOCELL CONTROL             | 6.00 EA EELEB       |     | 8    |       | 248    | 1         | 600      | 30      | 879       |
| TOTAL DIVISION 16 ELECTRICAL  |                                      |                     |     |      | 17    | 542    | 2         | 2,479    | 124     | 3,147     |
| TOTAL FACILITY AA. ELECTRICAL   |                                      |                     |     |      | 17    | 542    | 2         | 2,479    | 124     | 3,147     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           |                                      |                     |     |      | 17    | 542    | 2         | 2,479    | 124     | 3,147     |
| TOTAL BASE BID  |                                      |                     |     |      | 17    | 542    | 2         | 2,479    | 124     | 3,147     |
| TOTAL ADDITIVE  |                                      |                     |     |      | 0     | 0      | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     |                                      |                     |     |      | 17    | 542    | 2         | 2,479    | 124     | 3,147     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-258

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 158

TIME 14:11:43

PROJECT NOTES

SUMMARY PAGE 1

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PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-259

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 158

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BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT      | BOND       | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 3,147       | 10.0%<br>315 | 0.0%<br>0 | 7.5%<br>260 | 2.5%<br>93 | 0.0%<br>0 | 3,814      | 3814.09   |
| BID ITEM TOTAL |            | 1.00 EA | 3,147       | 315          | 0         | 260         | 93         | 0         | 3,814      | 3814.09   |
| TOTAL BASE BID |            |         | 3,147       | 315          | 0         | 260         | 93         | 0         | 3,814      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0          | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 3,147       | 315          | 0         | 260         | 93         | 0         | 3,814      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-260

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 158

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PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|--------------|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00 EA      | 3,814    |          | 3,814      | 3814.10   |
|    | TOTAL CURRENT CONTRACT COST                                |              | 3,814    | 0        | 3,814      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%         | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |              | 3,814    | 0        | 3,814      |           |
|    | Government-Furnished Property                              |              | 0        |          | 0          |           |
|    | SUBTOTAL   |              | 3,814    | 0        | 3,814      |           |
|    | Contingencies  | 10.0%        | 381      | 0        | 381        |           |
|    | SUBTOTAL   |              | 4,196    | 0        | 4,196      |           |
|    | SIOH (S&A)   | 5.0%         | 210      | 0        | 210        |           |
|    | CURRENT WORKING ESTIMATE                                   |              | 4,405    | 0        | 4,405      |           |
|    | Estimated Construction Time                                | 365 Days     |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-261



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 158

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CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | ** TOTAL DIRECT **<br>AMOUNT PCT | ** SUBCON **<br>W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|----------------------------------|------------------------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 17     | 542   | 2         | 2,602    | 3,147 100.0%                     | 0                      | 3,147    |
|    | TOTAL DIRECT  |    |          |     | 17     | 542   | 2         | 2,602    | 3,147 100.0%                     |                        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-262

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 158

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CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHER% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|--------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 3,147    | 315                        | 10.0% | 0.0   | 260                        | 7.5% | 2.5%  | 0.0%   | 3,814                                | 100.0% | 3814.09   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 315                        | 10.0% |       | 260                        | 7.5% |       |        |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 158

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CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 17       | 542   | 2         | 2,479    | 124       | 3,147                   |
| TOTAL DIRECT    | 17       | 542   | 2         | 2,479    | 124       | 3,147                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-264

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
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SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 17       | 542   | 2         | 2,479    | 124       | 3,147                   |
| TOTAL DIRECT           | 17       | 542   | 2         | 2,479    | 124       | 3,147                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-265

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
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EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP DESCRIPTION             | LIFE HRS | TL HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | HRLY RATE | UPB RATE | **** TOTAL HOURS | **** COST |
|-------------------------------|----------|---------|--------|------|------|--------|---------|-----------|----------|------------------|-----------|
| EMI20 SMALL TOOLS             |          |         |        |      |      |        |         | 1.40      | 1.40     | 2                | 2         |
| TOTAL PROJECT EQUIPMENT HOURS |          |         |        |      |      |        |         |           |          | 2                | 2         |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-266

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 158

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LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 17            | 543           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 17            | 543           |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 158E31

3-267

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE

30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 159  
BUILDING FUNCTION: MOTOR REPAIR SHOP

BUILDING USE:  
HOURS/DAY 24  
DAYS/WEEK 7

### EXISTING FIXTURE DATA:

LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 465 WATTS  
NUMBER OF FIXTURES 59

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
59 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 8,760 HR/YR = 240,331 KWH/YR

TOTAL EXISTING KW 27.44  
TOTAL EXISTING KWH 240,331

### REVISED LIGHTING CONTROL DATA

15 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 3,400 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
15 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 5,360 HR/YR = 37,386 KWH/YR  
44 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 8,760 HR/YR = 179,230 KWH/YR

TOTAL REVISED CONTROL KW 20.46  
TOTAL REVISED CONTROL KWH 216,616

NET ENERGY SAVINGS

80.92 MBTU/YR

NET DOLLAR SAVINGS

\$1,186 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:28:49

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 159

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-269



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

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| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

TIME 14:28:49

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  |  | QUANTITY | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|--|----------|-----|------|-------|--------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |  |          |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |  |          |     |      |       |        |           |          |         |           |
| CD=4 EL 1102  | NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: *** |          |     |      | 7.14  | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100   | 0.36 MLF EELEF                                       |          |     |      | 3     | 78     | 0         | 26       | 1       | 105       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |  |          |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |  |          |     |      |       |        |           |          |         |           |
| CD=3 EL 2003  | PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***     |          |     |      | 0.63  | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100   | BASED ON FOOTCANDLE READING 1.00 EA EELEB            |          |     |      | 1     | 21     | 0         | 600      | 30      | 651       |
| CD=3 EL 2004  | CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***    |          |     |      | 1.25  | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100   | ON/OFF PHOTOCELL CONTROL 3.00 EA EELEB               |          |     |      | 4     | 124    | 0         | 300      | 15      | 439       |
| TOTAL DIVISION 16 ELECTRICAL  |  |          |     |      | 7     | 222    | 1         | 926      | 46      | 1,195     |
| TOTAL FACILITY AA. ELECTRICAL   |  |          |     |      | 7     | 222    | 1         | 926      | 46      | 1,195     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           |  |          |     |      | 7     | 222    | 1         | 926      | 46      | 1,195     |
| TOTAL BASE BID  |  |          |     |      | 7     | 222    | 1         | 926      | 46      | 1,195     |
| TOTAL ADDITIVE  |  |          |     |      | 0     | 0      | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     |  |          |     |      | 7     | 222    | 1         | 926      | 46      | 1,195     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-271

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

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PROJECT NOTES

SUMMARY PAGE 1

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PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-272

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
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BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT     | BOND       | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|------------|------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 1,195       | 10.0%<br>120 | 0.0%<br>0 | 7.5%<br>99 | 2.5%<br>35 | 0.0%<br>0 | 1,449      | 1448.84   |
| BID ITEM TOTAL |            | 1.00 EA | 1,195       | 120          | 0         | 99         | 35         | 0         | 1,449      | 1448.84   |
| TOTAL BASE BID |            |         | 1,195       | 120          | 0         | 99         | 35         | 0         | 1,449      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0          | 0          | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 1,195       | 120          | 0         | 99         | 35         | 0         | 1,449      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-273

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

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PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00     | EA  | 1,449    |          | 1,449      | 1448.80   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 1,449    | 0        | 1,449      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 1,449    | 0        | 1,449      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 1,449    | 0        | 1,449      |           |
|    | Contingencies  | 10.0%    |     | 145      | 0        | 145        |           |
|    | SUBTOTAL   |          |     | 1,594    | 0        | 1,594      |           |
|    | SIOH (S&A)   | 5.0%     |     | 80       | 0        | 80         |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 1,673    | 0        | 1,673      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-274

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

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CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 7      | 222   | 1         | 972      | 1,195  | 100.0% | 0      | 1,195    |
|    | TOTAL DIRECT  |    |          |     | 7      | 222   | 1         | 972      | 1,195  | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

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CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHR% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|-------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 1,195    | 120                        | 10.0% | 0.0   | 99                         | 7.5% | 2.5%  | 0.0%  | 1,449                                | 100.0% | 1448.84   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 120                        | 10.0% |       | 99                         | 7.5% |       |       |                                      |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-276

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

TIME 14:28:49

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 7        | 222   | 1         | 926      | 46        | 1,195                   |
| TOTAL DIRECT    | 7        | 222   | 1         | 926      | 46        | 1,195                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-277



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

TIME 14:28:49

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 7        | 222   | 1         | 926      | 46        | 1,195                   |
| TOTAL DIRECT           | 7        | 222   | 1         | 926      | 46        | 1,195                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-278

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

TIME 14:28:49

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE *** ADJ FACTOR ADJUSTD BOOK OP -- HRLY --- UPB **** TOTAL **** |          |         |        |      |      |        |         |      |      |       |       |
|---|----------|---------|--------|------|------|--------|---------|------|------|-------|-------|
| EQUIP DESCRIPTION   | LIFE HRS | TL HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST  |
| -----   |          |         |        |      |      |        |         |      |      |       |       |
| EMI20 SMALL TOOLS   |          |         |        |      |      |        |         | 1.40 | 1.40 | 1     | 1     |
|   |          |         |        |      |      |        |         |      |      | ----- | ----- |
| TOTAL PROJECT EQUIPMENT HOURS   |          |         |        |      |      |        |         |      |      | 1     | 1     |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-279

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 159

TIME 14:28:49

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 7             | 222           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 7             | 222           |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 159E31

3-280

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE

30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2730  
BUILDING FUNCTION: VEHICLE REPAIR SHOP

BUILDING USE:  
HOURS/DAY 10  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 48

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
48 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,600 HR/YR = 56,784 KWH/YR

TOTAL EXISTING KWH 56,784

### REVISED LIGHTING CONTROL DATA

32 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 1,180 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
32 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,420 HR/YR = 20,675 KWH/YR  
16 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,600 HR/YR = 18,928 KWH/YR

TOTAL REVISED CONTROL KWH 39,603

NET ENERGY SAVINGS 58.62 MBTU/YR

NET DOLLAR SAVINGS

\$1,048 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:36:27

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2730

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-282

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

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| 1. BUILDING TO THE 5 FOOT LINE |             |
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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  |                                      | QUANTITY            | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|--------------------------------------|---------------------|-----|------|-------|--------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |                                      |                     |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |                                      |                     |     |      |       |        |           |          |         |           |
| CD=4 EL 1102  | NO. 12 AWG - TYPE THW INSULATION *** | UNIT COSTS: ***     |     |      | 7.14  | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100   | 1.44 MLF EELEF                       |                     |     | 10   |       | 310    | 1         | 105      | 5       | 421       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |                                      |                     |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |                                      |                     |     |      |       |        |           |          |         |           |
| CD=3 EL 2003  | PHOTOCELL FOR ON/OFF CONTROL         | *** UNIT COSTS: *** |     |      | 0.63  | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100   | BASED ON FOOTCANDLE READING          | 4.00 EA EELEB       |     | 3    |       | 83     | 0         | 2,400    | 120     | 2,603     |
| CD=3 EL 2004  | CIRCUIT FOR CONTROL PANEL FOR        | *** UNIT COSTS: *** |     |      | 1.25  | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100   | ON/OFF PHOTOCELL CONTROL             | 4.00 EA EELEB       |     | 5    |       | 165    | 1         | 400      | 20      | 586       |
| TOTAL DIVISION 16 ELECTRICAL  |                                      |                     |     |      | 18    | 558    | 2         | 2,905    | 145     | 3,610     |
| TOTAL FACILITY AA. ELECTRICAL   |                                      |                     |     |      | 18    | 558    | 2         | 2,905    | 145     | 3,610     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           |                                      |                     |     |      | 18    | 558    | 2         | 2,905    | 145     | 3,610     |
| TOTAL BASE BID  |                                      |                     |     |      | 18    | 558    | 2         | 2,905    | 145     | 3,610     |
| TOTAL ADDITIVE  |                                      |                     |     |      | 0     | 0      | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     |                                      |                     |     |      | 18    | 558    | 2         | 2,905    | 145     | 3,610     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-284

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-285



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2730

TIME 14:36:27

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   | COST TO PRM | OVERHEAD | HOME OFC     | PROFIT    | BOND        | OTHER FCTR  | TOTAL COST | UNIT COST     |
|----------------|------------|-------------|----------|--------------|-----------|-------------|-------------|------------|---------------|
| AA             | ELECTRICAL | 1.00 EA     | 3,610    | 10.0%<br>361 | 0.0%<br>0 | 7.5%<br>298 | 2.5%<br>107 | 0.0%<br>0  | 4,376 4375.57 |
| BID ITEM TOTAL |            | 1.00 EA     | 3,610    | 361          | 0         | 298         | 107         | 0          | 4,376 4375.57 |
| TOTAL BASE BID |            |             | 3,610    | 361          | 0         | 298         | 107         | 0          | 4,376         |
| TOTAL ADDITIVE |            |             | 0        | 0            | 0         | 0           | 0           | 0          | 0             |
| TOTAL INCL ADD |            |             | 3,610    | 361          | 0         | 298         | 107         | 0          | 4,376         |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-286

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|-----|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA  | 4,376    |          | 4,376      | 4375.60   |
|    | TOTAL CURRENT CONTRACT COST                                |          |     | 4,376    | 0        | 4,376      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |     | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |     | 4,376    | 0        | 4,376      |           |
|    | Government-Furnished Property                              |          |     | 0        |          | 0          |           |
|    | SUBTOTAL   |          |     | 4,376    | 0        | 4,376      |           |
|    | Contingencies  | 10.0%    |     | 438      | 0        | 438        |           |
|    | SUBTOTAL   |          |     | 4,813    | 0        | 4,813      |           |
|    | SIOH (S&A)   | 5.0%     |     | 241      | 0        | 241        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |     | 5,054    | 0        | 5,054      |           |

Estimated Construction Time 365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-287

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT   | W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|-------|------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 18     | 558   | 2         | 3,050 |      | 3,610  | 100.0% | 0      | 3,610    |
|    | TOTAL DIRECT  |    |          |     | 18     | 558   | 2         | 3,050 |      | 3,610  | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID CONTRACTOR           |               | PM | SUBTOTAL | *** OVERHEAD *** |       | **** PROFIT **** |        | ***** TOTAL CONTRACT ***** |              | UNIT COST |        |         |
|-------------------------|---------------|----|----------|------------------|-------|------------------|--------|----------------------------|--------------|-----------|--------|---------|
|                         |               |    |          | AMOUNT           | PCT   | HOFC%            | AMOUNT | PCT                        | BOND% OTHER% | AMOUNT    | PCT    |         |
| AA                      | GENERAL/PRIME |    | 3,610    | 361              | 10.0% | 0.0              | 298    | 7.5%                       | 2.5% 0.0%    | 4,376     | 100.0% | 4375.56 |
|                         |               |    |          | -----            |       |                  | -----  |                            |              |           |        |         |
| TOTAL OVERHEAD & PROFIT |               |    |          | 361              | 10.0% |                  | 298    | 7.5%                       |              |           |        |         |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-289

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 18       | 558   | 2         | 2,905    | 145       | 3,610                   |
| TOTAL DIRECT    | 18       | 558   | 2         | 2,905    | 145       | 3,610                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-290

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
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TIME 14:36:27

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 18       | 558   | 2         | 2,905    | 145       | 3,610                   |
| TOTAL DIRECT           | 18       | 558   | 2         | 2,905    | 145       | 3,610                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS H-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

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EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP DESCRIPTION             | LIFE HRS | TL HRLY | OWNRSHP | OWNS | OVTM | OWNRSHP | EXPENSE | HRLY RATE | UPB RATE | HOURS | TOTAL COST |
|-------------------------------|----------|---------|---------|------|------|---------|---------|-----------|----------|-------|------------|
| EMI20 SMALL TOOLS             |          |         |         |      |      |         |         | 1.40      | 1.40     | 2     | 2          |
| TOTAL PROJECT EQUIPMENT HOURS |          |         |         |      |      |         |         |           |          | 2     | 2          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-292

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2730

TIME 14:36:27

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 18            | 558           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 18            | 558           |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 273031

3-293



# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE

30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2942

BUILDING FUNCTION: MOTOR REPAIR SHOP

BUILDING USE:

HOURS/DAY 8

DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE HIGH PRESSURE SODIUM

FIXTURE WATTAGE 465 WATTS

NUMBER OF FIXTURES 33

### ELECTRIC COSTS:

ENERGY CHARGE

\$0.02506 PER KWH

DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR

33 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,080 HR/YR = 31,918 KWH/YR

TOTAL EXISTING KWH

31,918

### REVISED LIGHTING CONTROL DATA

20 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR

0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR

20 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 1,160 HR/YR = 10,788 KWH/YR

13 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,080 HR/YR = 12,574 KWH/YR

TOTAL REVISED CONTROL KWH

23,362

NET ENERGY SAVINGS

29.19 MBTU/YR

NET DOLLAR SAVINGS

\$609 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:43:43

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2942

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

M - C A C E S E D I T I O N  
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Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-295

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

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| DETAILED ESTIMATE              | DETAIL PAGE |
|--------------------------------|-------------|
| 1. BUILDING TO THE 5 FOOT LINE |             |
| AA. ELECTRICAL.....            | 1           |

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  |  | QUANTITY | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|--|----------|-----|------|-------|--------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |  |          |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |  |          |     |      |       |        |           |          |         |           |
| CD=4 EL 1102  | NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: *** | 7.14     |     |      |       | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100   | 1.08 MLF EELEF                                       | 8        |     |      |       | 233    | 1         | 79       | 4       | 316       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |  |          |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |  |          |     |      |       |        |           |          |         |           |
| CD=3 EL 2003  | PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***     | 0.63     |     |      |       | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100   | BASED ON FOOTCANDLE READING 3.00 EA EELEB            | 2        |     |      |       | 62     | 0         | 1,800    | 90      | 1,952     |
| CD=3 EL 2004  | CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***    | 1.25     |     |      |       | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100   | ON/OFF PHOTOCELL CONTROL 4.00 EA EELEB               | 5        |     |      |       | 165    | 1         | 400      | 20      | 586       |
| TOTAL DIVISION 16 ELECTRICAL  |  | 15       |     |      |       | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL FACILITY AA. ELECTRICAL   |  | 15       |     |      |       | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           |  | 15       |     |      |       | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL BASE BID  |  | 15       |     |      |       | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL ADDITIVE  |  | 0        |     |      |       | 0      | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     |  | 15       |     |      |       | 460    | 2         | 2,279    | 114     | 2,854     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-297

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-298

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2942

TIME 14:43:43

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   | COST TO PRM | OVERHEAD | HOME OFC | PROFIT | BOND | OTHER FCTR | TOTAL COST | UNIT COST |
|----------------|------------|-------------|----------|----------|--------|------|------------|------------|-----------|
| AA             | ELECTRICAL |             | 10.0%    | 0.0%     | 7.5%   | 2.5% | 0.0%       |            |           |
|                | 1.00 EA    | 2,854       | 285      | 0        | 235    | 84   | 0          | 3,459      | 3459.15   |
| BID ITEM TOTAL | 1.00 EA    | 2,854       | 285      | 0        | 235    | 84   | 0          | 3,459      | 3459.15   |
| TOTAL BASE BID |            | 2,854       | 285      | 0        | 235    | 84   | 0          | 3,459      |           |
| TOTAL ADDITIVE |            | 0           | 0        | 0        | 0      | 0    | 0          | 0          |           |
| TOTAL INCL ADD |            | 2,854       | 285      | 0        | 235    | 84   | 0          | 3,459      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-299

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2942

TIME 14:43:43

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM  | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|------|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00     | EA   | 3,459    |          | 3,459      | 3459.20   |
|    | TOTAL CURRENT CONTRACT COST                                |          |      | 3,459    | 0        | 3,459      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |      | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |      | 3,459    | 0        | 3,459      |           |
|    | Government-Furnished Property                              |          |      | 0        |          | 0          |           |
|    | SUBTOTAL   |          |      | 3,459    | 0        | 3,459      |           |
|    | Contingencies  | 10.0%    |      | 346      | 0        | 346        |           |
|    | SUBTOTAL   |          |      | 3,805    | 0        | 3,805      |           |
|    | SIOH (S&A)   | 5.0%     |      | 190      | 0        | 190        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |      | 3,995    | 0        | 3,995      |           |
|    | Estimated Construction Time                                | 365      | Days |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-300

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | ** TOTAL DIRECT *<br>AMOUNT PCT | * SUBCON *<br>W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|---------------------------------|----------------------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 15     | 460   | 2         | 2,392    | 2,854 100.0%                    | 0                    | 2,854    |
|    | TOTAL DIRECT  |    |          |     | 15     | 460   | 2         | 2,392    | 2,854 100.0%                    |                      |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-301



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

| ID | CONTRACTOR              | PM | SUBTOTAL | *** OVERHEAD ***<br>AMOUNT | PCT   | HOFC% | **** PROFIT ****<br>AMOUNT | PCT  | BOND% | OTHR% | ***** TOTAL CONTRACT *****<br>AMOUNT | PCT    | UNIT COST |
|----|-------------------------|----|----------|----------------------------|-------|-------|----------------------------|------|-------|-------|--------------------------------------|--------|-----------|
| AA | GENERAL/PRIME           |    | 2,854    | 285                        | 10.0% | 0.0   | 235                        | 7.5% | 2.5%  | 0.0%  | 3,459                                | 100.0% | 3459.15   |
|    | TOTAL OVERHEAD & PROFIT |    |          | 285                        | 10.0% |       | 235                        | 7.5% |       |       |                                      |        |           |

REW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-302

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |
| TOTAL DIRECT    | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-303

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |
| TOTAL DIRECT           | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-304

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| EQUIP DESCRIPTION             | LIFE HRS | TL HRLY | OWNRSH | OWNS | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST |
|-------------------------------|----------|---------|--------|------|------|--------|---------|------|------|-------|------|
| EMI20 SMALL TOOLS             |          |         |        |      |      |        |         | 1.40 | 1.40 | 1     | 2    |
| TOTAL PROJECT EQUIPMENT HOURS |          |         |        |      |      |        |         |      |      | 1     | 2    |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-305

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2942

TIME 14:43:43

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 15            | 460           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 15            | 460           |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294231

3-306

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION -- ON/OFF PHOTOCELLS

BUILDING #: 2943  
BUILDING FUNCTION: MOTOR REPAIR SHOP

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 465 WATTS  
NUMBER OF FIXTURES 33

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
33 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,080 HR/YR = 31,918 KWH/YR

TOTAL EXISTING KWH

31,918

### REVISED LIGHTING CONTROL DATA

20 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
20 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 1,160 HR/YR = 10,788 KWH/YR  
13 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,080 HR/YR = 12,574 KWH/YR

TOTAL REVISED CONTROL KWH

23,362

NET ENERGY SAVINGS

29.19 MBTU/YR

NET DOLLAR SAVINGS

\$609 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 14:50:51

TITLE PAGE

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LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2943

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93

Current UPB/CSI ID: ORL290

M - C A C E S   E D I T I O N  
COMPOSER Plus Copyright (C) 1985, 1988  
by Building Systems Design, Inc.  
Release 4.20

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-308

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

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| AA. ELECTRICAL.....            | 1           |

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

DETAILED ESTIMATE

DETAIL PAGE 1

1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

BASE BID

| DIVISION 16 ELECTRICAL  |                                      | QUANTITY            | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|--------------------------------------|---------------------|-----|------|-------|--------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |                                      |                     |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |                                      |                     |     |      |       |        |           |          |         |           |
| CD=4 EL 1102  | NO. 12 AWG - TYPE THW INSULATION *** | UNIT COSTS: ***     |     |      | 7.14  | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100   |                                      | 1.08 MLF EELEF      |     | 8    |       | 233    | 1         | 79       | 4       | 316       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |                                      |                     |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |                                      |                     |     |      |       |        |           |          |         |           |
| CD=3 EL 2003  | PHOTOCELL FOR ON/OFF CONTROL         | *** UNIT COSTS: *** |     |      | 0.63  | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100   | BASED ON FOOTCANDLE READING          | 3.00 EA EELEB       |     | 2    |       | 62     | 0         | 1,800    | 90      | 1,952     |
| CD=3 EL 2004  | CIRCUIT FOR CONTROL PANEL FOR        | *** UNIT COSTS: *** |     |      | 1.25  | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100   | ON/OFF PHOTOCELL CONTROL             | 4.00 EA EELEB       |     | 5    |       | 165    | 1         | 400      | 20      | 586       |
| TOTAL DIVISION 16 ELECTRICAL  |                                      |                     |     |      | 15    | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL FACILITY AA. ELECTRICAL   |                                      |                     |     |      | 15    | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           |                                      |                     |     |      | 15    | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL BASE BID  |                                      |                     |     |      | 15    | 460    | 2         | 2,279    | 114     | 2,854     |
| TOTAL ADDITIVE  |                                      |                     |     |      | 0     | 0      | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     |                                      |                     |     |      | 15    | 460    | 2         | 2,279    | 114     | 2,854     |

\* \* \* END OF DETAIL REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-310

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-311

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
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BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD | HOME OFC | PROFIT | BOND | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|----------|----------|--------|------|-----------|------------|-----------|
| AA             | ELECTRICAL |         |             | 10.0%    | 0.0%     | 7.5%   | 2.5% | 0.0%      |            |           |
|                |            | 1.00 EA | 2,854       | 285      | 0        | 235    | 84   | 0         | 3,459      | 3459.15   |
| BID ITEM TOTAL |            | 1.00 EA | 2,854       | 285      | 0        | 235    | 84   | 0         | 3,459      | 3459.15   |
| TOTAL BASE BID |            |         | 2,854       | 285      | 0        | 235    | 84   | 0         | 3,459      |           |
| TOTAL ADDITIVE |            |         | 0           | 0        | 0        | 0      | 0    | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 2,854       | 285      | 0        | 235    | 84   | 0         | 3,459      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-312

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM  | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|------|----------|----------|------------|-----------|
|    | 1. BUILDING TO THE 5 FOOT LINE                             | 1.00     | EA   | 3,459    |          | 3,459      | 3459.20   |
|    | TOTAL CURRENT CONTRACT COST                                |          |      | 3,459    | 0        | 3,459      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |      | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |      | 3,459    | 0        | 3,459      |           |
|    | Government-Furnished Property                              |          |      | 0        |          | 0          |           |
|    | SUBTOTAL   |          |      | 3,459    | 0        | 3,459      |           |
|    | Contingencies  | 10.0%    |      | 346      | 0        | 346        |           |
|    | SUBTOTAL   |          |      | 3,805    | 0        | 3,805      |           |
|    | SIOH (S&A)   | 5.0%     |      | 190      | 0        | 190        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |      | 3,995    | 0        | 3,995      |           |
|    | Estimated Construction Time                                | 365      | Days |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-313

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR | EQUIPMENT | MAT W/TX | AMOUNT | PCT    | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|-------|-----------|----------|--------|--------|--------|----------|
| AA | GENERAL/PRIME |    | 1.00     | EA  | 15     | 460   | 2         | 2,392    | 2,854  | 100.0% | 0      | 2,854    |
|    | TOTAL DIRECT  |    |          |     | 15     | 460   | 2         | 2,392    | 2,854  | 100.0% |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-314

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
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CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

|    |               | *** OVERHEAD *** |                         |        | **** PROFIT **** |       |        |      | ***** TOTAL CONTRACT ***** |        |        |        |           |
|----|---------------|------------------|-------------------------|--------|------------------|-------|--------|------|----------------------------|--------|--------|--------|-----------|
| ID | CONTRACTOR    | PM               | SUBTOTAL                | AMOUNT | PCT              | HOFC% | AMOUNT | PCT  | BOND%                      | OTHER% | AMOUNT | PCT    | UNIT COST |
| AA | GENERAL/PRIME |                  | 2,854                   | 285    | 10.0%            | 0.0   | 235    | 7.5% | 2.5%                       | 0.0%   | 3,459  | 100.0% | 3459.15   |
|    |               |                  |                         | -----  |                  |       | -----  |      |                            |        |        |        |           |
|    |               |                  |                         | 285    | 10.0%            |       | 235    | 7.5% |                            |        |        |        |           |
|    |               |                  | TOTAL OVERHEAD & PROFIT |        |                  |       |        |      |                            |        |        |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-315

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |
| TOTAL DIRECT    | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-316

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |
| TOTAL DIRECT           | 15       | 460   | 2         | 2,279    | 114       | 2,854                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-317



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR |    | ADJUSTD |        | BOOK OP |      | --     | HRLY    | ---  | UPB  | ****  | TOTAL | **** |
|-------------------------------|-------------|------------|----|---------|--------|---------|------|--------|---------|------|------|-------|-------|------|
| EQUIP                         | DESCRIPTION | LIFE HRS   | TL | HRLY    | OWNRSH | OWNS    | OVTM | OWNRSH | EXPENSE | RATE | RATE | HOURS | COST  |      |
| EMI20                         | SMALL TOOLS |            |    |         |        |         |      |        |         | 1.40 | 1.40 | 1     | 2     |      |
|                               |             |            |    |         |        |         |      |        |         |      |      | 1     | 2     |      |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |    |         |        |         |      |        |         |      |      |       |       |      |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-318

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2943

TIME 14:50:51

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 15            | 460           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 15            | 460           |

\*\*\* END OF SUMMARY REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294331

3-319

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2944  
BUILDING FUNCTION: TANK REPAIR SHOP

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE HIGH PRESSURE SODIUM  
FIXTURE WATTAGE 465 WATTS  
NUMBER OF FIXTURES 63

### ELECTRIC COSTS:

ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
63 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,080 HR/YR = 60,934 KWH/YR

TOTAL EXISTING KWH 60,934

### REVISED LIGHTING CONTROL DATA

36 FIXTS. @ 0.465 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.465 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
36 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 1,180 HR/YR = 19,418 KWH/YR  
27 FIXTS. @ 0.465 KW @ 100% OUTPUT \* 2,080 HR/YR = 26,114 KWH/YR

TOTAL REVISED CONTROL KWH 45,532

NET ENERGY SAVINGS 52.55 MBTU/YR

NET DOLLAR SAVINGS \$1,096 /YR

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:05:25

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2944

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-321

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

TIME 15:05:25

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2944  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:05:25

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  |  | QUANTITY | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|--|----------|-----|------|-------|--------|-----------|----------|---------|-----------|
| 16050 BASIC MATERIALS AND METHODS                                       |  |          |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |  |          |     |      |       |        |           |          |         |           |
| CD=4 EL 1102  | NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: *** | 7.14     |     |      |       | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100   | 1.80 MLF EELEF                                       | 13       |     |      |       | 388    | 2         | 131      | 7       | 527       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |  |          |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |  |          |     |      |       |        |           |          |         |           |
| CD=3 EL 2003  | PHOTOCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***     | 0.63     |     |      |       | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100   | BASED ON FOOTCANDLE READING 5.00 EA EELEB            | 3        |     |      |       | 103    | 0         | 3,000    | 150     | 3,254     |
| CD=3 EL 2004  | CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***    | 1.25     |     |      |       | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100   | ON/OFF PHOTOCELL CONTROL 10.00 EA EELEB              | 13       |     |      |       | 413    | 2         | 1,000    | 50      | 1,464     |
| TOTAL DIVISION 16 ELECTRICAL  |  | 28       |     |      |       | 903    | 4         | 4,131    | 207     | 5,245     |
| TOTAL FACILITY AA. ELECTRICAL   |  | 28       |     |      |       | 903    | 4         | 4,131    | 207     | 5,245     |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           |  | 28       |     |      |       | 903    | 4         | 4,131    | 207     | 5,245     |
| TOTAL BASE BID  |  | 28       |     |      |       | 903    | 4         | 4,131    | 207     | 5,245     |
| TOTAL ADDITIVE  |  | 0        |     |      |       | 0      | 0         | 0        | 0       | 0         |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     |  | 28       |     |      |       | 903    | 4         | 4,131    | 207     | 5,245     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-323

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

TIME 15:05:25

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-324

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2944

TIME 15:05:25

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HOME OFC  | PROFIT      | BOND        | OTHR FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|-------------|-----------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 5,245       | 10.0%<br>524 | 0.0%<br>0 | 7.5%<br>433 | 2.5%<br>155 | 0.0%<br>0 | 6,357      | 6356.83   |
| BID ITEM TOTAL |            | 1.00 EA | 5,245       | 524          | 0         | 433         | 155         | 0         | 6,357      | 6356.83   |
| TOTAL BASE BID |            |         | 5,245       | 524          | 0         | 433         | 155         | 0         | 6,357      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0           | 0         | 0          |           |
| TOTAL INCL ADD |            |         | 5,245       | 524          | 0         | 433         | 155         | 0         | 6,357      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-325



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2944

TIME 15:05:25

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID | BID ITEM   | QUANTITY | UOM  | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|----|--|----------|------|----------|----------|------------|-----------|
| 1. | BUILDING TO THE 5 FOOT LINE                                | 1.00     | EA   | 6,357    |          | 6,357      | 6356.80   |
|    | TOTAL CURRENT CONTRACT COST                                |          |      | 6,357    | 0        | 6,357      |           |
|    | Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 | 0.0%     |      | 0        | 0        | 0          |           |
|    | ESCALATED CONTRACT COST                                    |          |      | 6,357    | 0        | 6,357      |           |
|    | Government-Furnished Property                              |          |      | 0        |          | 0          |           |
|    | SUBTOTAL   |          |      | 6,357    | 0        | 6,357      |           |
|    | Contingencies  | 10.0%    |      | 636      | 0        | 636        |           |
|    | SUBTOTAL   |          |      | 6,992    | 0        | 6,992      |           |
|    | SIOH (S&A)   | 5.0%     |      | 350      | 0        | 350        |           |
|    | CURRENT WORKING ESTIMATE                                   |          |      | 7,342    | 0        | 7,342      |           |
|    | Estimated Construction Time                                | 365      | Days |          |          |            |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-326

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

TIME 15:05:25

CONTRACTOR DIRECT SUMMARY

SUMMARY PAGE 4

| ID | CONTRACTOR    | PM | QUANTITY | UOM | MANHRS | LABOR  | EQUIPMENT | MAT   | W/TX  | ** TOTAL DIRECT * | ** SUBCON * | W/OH&P | SUBTOTAL |
|----|---------------|----|----------|-----|--------|--------|-----------|-------|-------|-------------------|-------------|--------|----------|
|    |               |    |          |     |        | AMOUNT | PCT       |       |       |                   |             |        |          |
| AA | GENERAL/PRIME |    | 1.00     | EA  | 28     | 903    | 4         | 4,337 | 5,245 | 100.0%            | 0           |        | 5,245    |
|    | TOTAL DIRECT  |    |          |     | 28     | 903    | 4         | 4,337 | 5,245 | 100.0%            |             |        |          |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-327

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

TIME 15:05:25

CONTRACTOR INDIRECT SUMMARY

SUMMARY PAGE 5

|    |               | *** OVERHEAD *** |                         |        | **** PROFIT **** |       |        | ***** TOTAL CONTRACT ***** |       |       |        |        |           |
|----|---------------|------------------|-------------------------|--------|------------------|-------|--------|----------------------------|-------|-------|--------|--------|-----------|
| ID | CONTRACTOR    | PH               | SUBTOTAL                | AMOUNT | PCT              | HOFC% | AMOUNT | PCT                        | BOND% | OTHR% | AMOUNT | PCT    | UNIT COST |
| AA | GENERAL/PRIME |                  | 5,245                   | 524    | 10.0%            | 0.0   | 433    | 7.5%                       | 2.5%  | 0.0%  | 6,357  | 100.0% | 6356.82   |
|    |               |                  |                         | 524    | 10.0%            |       | 433    | 7.5%                       |       |       |        |        |           |
|    |               |                  | TOTAL OVERHEAD & PROFIT |        |                  |       |        |                            |       |       |        |        |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-328

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

TIME 15:05:25

CSI DIVISION SUMMARY

SUMMARY PAGE 6

| ID CSI DIVISION | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|-----------------|----------|-------|-----------|----------|-----------|-------------------------|
| 16 ELECTRICAL   | 28       | 903   | 4         | 4,131    | 207       | 5,245                   |
| TOTAL DIRECT    | 28       | 903   | 4         | 4,131    | 207       | 5,245                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-329

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

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SYSTEMS SUMMARY

SUMMARY PAGE 7

| ID SYSTEM              | MANHOURS | LABOR | EQUIPMENT | MATERIAL | SALES TAX | ***** TOTAL *<br>DIRECT |
|------------------------|----------|-------|-----------|----------|-----------|-------------------------|
| 11 INTERIOR ELECTRICAL | 28       | 903   | 4         | 4,131    | 207       | 5,245                   |
| TOTAL DIRECT           | 28       | 903   | 4         | 4,131    | 207       | 5,245                   |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

TIME 15:05:25

EQUIPMENT SUMMARY

SUMMARY PAGE 8

| ----- *** BOOK VALUE ***      |             | ADJ FACTOR |         | ADJUSTD |      | BOOK OP -- |        | HRLY --- |      | UPB  |       | **** TOTAL **** |  |
|-------------------------------|-------------|------------|---------|---------|------|------------|--------|----------|------|------|-------|-----------------|--|
| EQUIP                         | DESCRIPTION | LIFE HRS   | TL HRLY | OWNRSH  | OWNS | OVTM       | OWNRSH | EXPENSE  | RATE | RATE | HOURS | COST            |  |
| EMI20                         | SMALL TOOLS |            |         |         |      |            |        |          | 1.40 | 1.40 | 3     | 4               |  |
| TOTAL PROJECT EQUIPMENT HOURS |             |            |         |         |      |            |        |          |      |      | 3     | 4               |  |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-331

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2944

TIME 15:05:25

LABOR SUMMARY

SUMMARY PAGE 9

| CRAFT DESCRIPTION      | BASE  | OVERTM | TXS/INS | FRNG | TRVL | HRLY<br>RATE | UPB<br>RATE | ****<br>HOURS | TOTAL<br>COST |
|------------------------|-------|--------|---------|------|------|--------------|-------------|---------------|---------------|
| LELEC ELECTRICIANS     | 20.50 | 0.0%   | 24.0%   | 7.49 | 0.00 | 32.91        | 25.79       | 28            | 904           |
| TOTAL PROJECT MANHOURS |       |        |         |      |      |              |             | 28            | 904           |

\* \* \* END OF SUMMARY REPORT \* \* \*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 294431

3-332

# FORT KNOX LIMITED ENERGY STUDY

ECO 3.1: INSTALL PHOTOCELL LIGHTING CONTROLS TO REDUCE LIGHT LEVELS WHEN POSSIBLE  
30 SEPTEMBER 1993

## FACILITY LIGHTING CONTROL INSTALLATION - ON/OFF PHOTOCELLS

BUILDING #: 2963  
BUILDING FUNCTION: TANK REPAIR SHOP

BUILDING USE:  
HOURS/DAY 8  
DAYS/WEEK 5

### EXISTING FIXTURE DATA:

LAMP TYPE METAL HALIDE  
FIXTURE WATTAGE 455 WATTS  
NUMBER OF FIXTURES 18

ELECTRIC COSTS:  
ENERGY CHARGE \$0.02506 PER KWH  
DEMAND CHARGE \$7.067 PER KW

### EXISTING LIGHTING CONTROL DATA

0 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* 0 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* 0 HR/YR = 0 KWH/YR  
18 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 17,035 KWH/YR

TOTAL EXISTING KWH 17,035

### REVISED LIGHTING CONTROL DATA

12 FIXTS. @ 0.455 KW @ 0% OUTPUT \* 920 HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 10% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 20% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 40% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 60% OUTPUT \* HR/YR = 0 KWH/YR  
0 FIXTS. @ 0.455 KW @ 80% OUTPUT \* HR/YR = 0 KWH/YR  
12 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 1,160 HR/YR = 6,334 KWH/YR  
6 FIXTS. @ 0.455 KW @ 100% OUTPUT \* 2,080 HR/YR = 5,878 KWH/YR

TOTAL REVISED CONTROL KWH 12,012

NET ENERGY SAVINGS 17.14 MBTU/YR

NET DOLLAR SAVINGS \$357 /YR



Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES

TIME 15:13:33

TITLE PAGE

---

LIMITED ENERGY STUDY  
FT KNOX, KY  
ECO-3.1: BUILDING 2963

Contract No: 27-93-C-0096

Prepared By: Systems Corp  
Estimator: Julie A. Hollensbe  
Estimate Prep. Date: 09/30/93  
Current UPB/CSI ID: ORL290

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CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

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DETAILED ESTIMATE

DETAIL PAGE

|                                |   |
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| 1. BUILDING TO THE 5 FOOT LINE |   |
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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2963  
 1. BUILDING TO THE 5 FOOT LINE / AA. ELECTRICAL

TIME 15:13:33

DETAILED ESTIMATE

DETAIL PAGE 1

BASE BID

| DIVISION 16 ELECTRICAL  | QUANTITY | UOM | CREW | MANHR | LABOR  | EQUIPMENT | MATERIAL | SALESTX | DIRECT \$ |
|---|----------|-----|------|-------|--------|-----------|----------|---------|-----------|
| <hr/>   |          |     |      |       |        |           |          |         |           |
| 16050 BASIC MATERIALS AND METHODS                                       |          |     |      |       |        |           |          |         |           |
| 16120 1100 SINGLE SOLID CONDUCTOR.                                      |          |     |      |       |        |           |          |         |           |
| CD=4 EL 1102 NO. 12 AWG - TYPE THW INSULATION *** UNIT COSTS: ***       | 7.14     |     |      |       | 215.37 | 0.97      | 72.72    | 3.64    | 292.69    |
| WC=1100 0.72 MLF EELEF  | 5        |     |      |       | 155    | 1         | 52       | 3       | 211       |
| 16900 CONTROLS AND INSTRUMENTATION                                      |          |     |      |       |        |           |          |         |           |
| 16930 2000 PHOTO-CELL, RELAY, LIGHTING ARRESTER, RECEPTACLE AND BRACKET |          |     |      |       |        |           |          |         |           |
| CD=3 EL 2003 PHOTOCCELL FOR ON/OFF CONTROL *** UNIT COSTS: ***          | 0.63     |     |      |       | 20.63  | 0.08      | 600.00   | 30.00   | 650.71    |
| WC=1100 BASED ON FOOTCANDLE READING 2.00 EA EELEB                       | 1        |     |      |       | 41     | 0         | 1,200    | 60      | 1,301     |
| CD=3 EL 2004 CIRCUIT FOR CONTROL PANEL FOR *** UNIT COSTS: ***          | 1.25     |     |      |       | 41.26  | 0.16      | 100.00   | 5.00    | 146.42    |
| WC=1100 ON/OFF PHOTOCCELL CONTROL 4.00 EA EELEB                         | 5        |     |      |       | 165    | 1         | 400      | 20      | 586       |
| <hr/>   |          |     |      |       |        |           |          |         |           |
| TOTAL DIVISION 16 ELECTRICAL  | 11       |     |      |       | 361    | 2         | 1,652    | 83      | 2,098     |
| <hr/>   |          |     |      |       |        |           |          |         |           |
| TOTAL FACILITY AA. ELECTRICAL   | 11       |     |      |       | 361    | 2         | 1,652    | 83      | 2,098     |
| <hr/>   |          |     |      |       |        |           |          |         |           |
| TOTAL BID ITEM 1. BUILDING TO THE 5 FOOT LINE                           | 11       |     |      |       | 361    | 2         | 1,652    | 83      | 2,098     |
| <hr/>   |          |     |      |       |        |           |          |         |           |
| TOTAL BASE BID  | 11       |     |      |       | 361    | 2         | 1,652    | 83      | 2,098     |
| <hr/>   |          |     |      |       |        |           |          |         |           |
| TOTAL ADDITIVE  | 0        |     |      |       | 0      | 0         | 0        | 0       | 0         |
| <hr/>   |          |     |      |       |        |           |          |         |           |
| TOTAL INCL ADD LIMITED ENERGY STUDY                                     | 11       |     |      |       | 361    | 2         | 1,652    | 83      | 2,098     |

\*\*\* END OF DETAIL REPORT \*\*\*

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

PROJECT NOTES

SUMMARY PAGE 1

---

PROJECT NOTES

ECO-3: FACILITY LIGHTING CONTROLS

SCOPE OF WORK: EVALUATE USE OF LIGHTING CONTROLS TO SAVE ENERGY IN  
SELECTED FACILITIES AT FT KNOX.

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

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Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
 LIMITED ENERGY STUDY / FT KNOX, KY  
 ECO-3.1: BUILDING 2963

TIME 15:13:33

BID ITEM AND FACILITY SUMMARY

SUMMARY PAGE 2

BID ITEM 1 BUILDING TO THE 5 FOOT LINE

BASE BID

| ID             | FACILITY   |         | COST TO PRM | OVERHEAD     | HONE OFC  | PROFIT      | BOND       | OTHER FCTR | TOTAL COST | UNIT COST |
|----------------|------------|---------|-------------|--------------|-----------|-------------|------------|------------|------------|-----------|
| AA             | ELECTRICAL | 1.00 EA | 2,098       | 10.0%<br>210 | 0.0%<br>0 | 7.5%<br>173 | 2.5%<br>62 | 0.0%<br>0  | 2,543      | 2542.73   |
| BID ITEM TOTAL |            | 1.00 EA | 2,098       | 210          | 0         | 173         | 62         | 0          | 2,543      | 2542.73   |
| TOTAL BASE BID |            |         | 2,098       | 210          | 0         | 173         | 62         | 0          | 2,543      |           |
| TOTAL ADDITIVE |            |         | 0           | 0            | 0         | 0           | 0          | 0          | 0          |           |
| TOTAL INCL ADD |            |         | 2,098       | 210          | 0         | 173         | 62         | 0          | 2,543      |           |

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-338

Fri 17 Sep 1993

U.S. ARMY CORPS of ENGINEERS M-CACES  
LIMITED ENERGY STUDY / FT KNOX, KY  
ECO-3.1: BUILDING 2963

TIME 15:13:33

PROJECT CWE SUMMARY

SUMMARY PAGE 3

| ID   | BID ITEM                    | QUANTITY | UOM | BASE BID | ADDITIVE | TOTAL COST | UNIT COST |
|--|-----------------------------|----------|-----|----------|----------|------------|-----------|
| 1.   | BUILDING TO THE 5 FOOT LINE | 1.00     | EA  | 2,543    |          | 2,543      | 2542.70   |
| TOTAL CURRENT CONTRACT COST                                |                             |          |     | 2,543    | 0        | 2,543      |           |
| Cost Growth from 09/93 to 09/94<br>Index Values: 0000 0000 |                             | 0.0%     |     | 0        | 0        | 0          |           |
| ESCALATED CONTRACT COST                                    |                             |          |     | 2,543    | 0        | 2,543      |           |
| Government-Furnished Property                              |                             |          |     | 0        |          | 0          |           |
| SUBTOTAL   |                             |          |     | 2,543    | 0        | 2,543      |           |
| Contingencies  |                             | 10.0%    |     | 254      | 0        | 254        |           |
| SUBTOTAL   |                             |          |     | 2,797    | 0        | 2,797      |           |
| SIOH (S&A)   |                             | 5.0%     |     | 140      | 0        | 140        |           |
| CURRENT WORKING ESTIMATE                                   |                             |          |     | 2,937    | 0        | 2,937      |           |

Estimated Construction Time

365 Days

CREW ID: ORL290

CURRENCY in DOLLARS

PROJECT ID: 296331

3-339